THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVI. No. 1958.] LONDON, NOVEMBER 20, 1900. [52ND YEAR. PRICE 6d.

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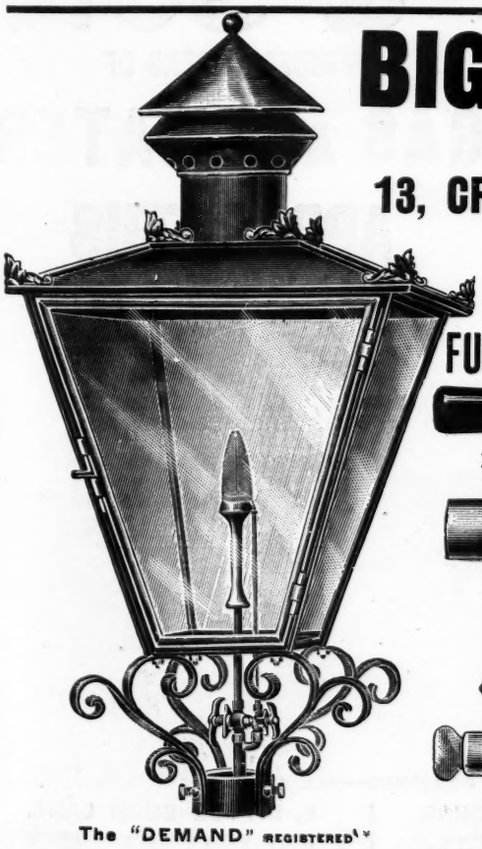
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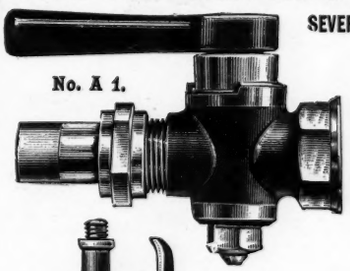
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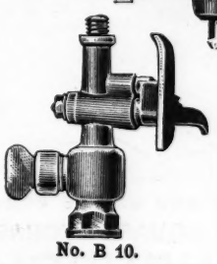
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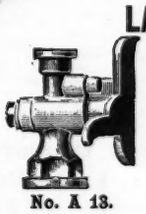
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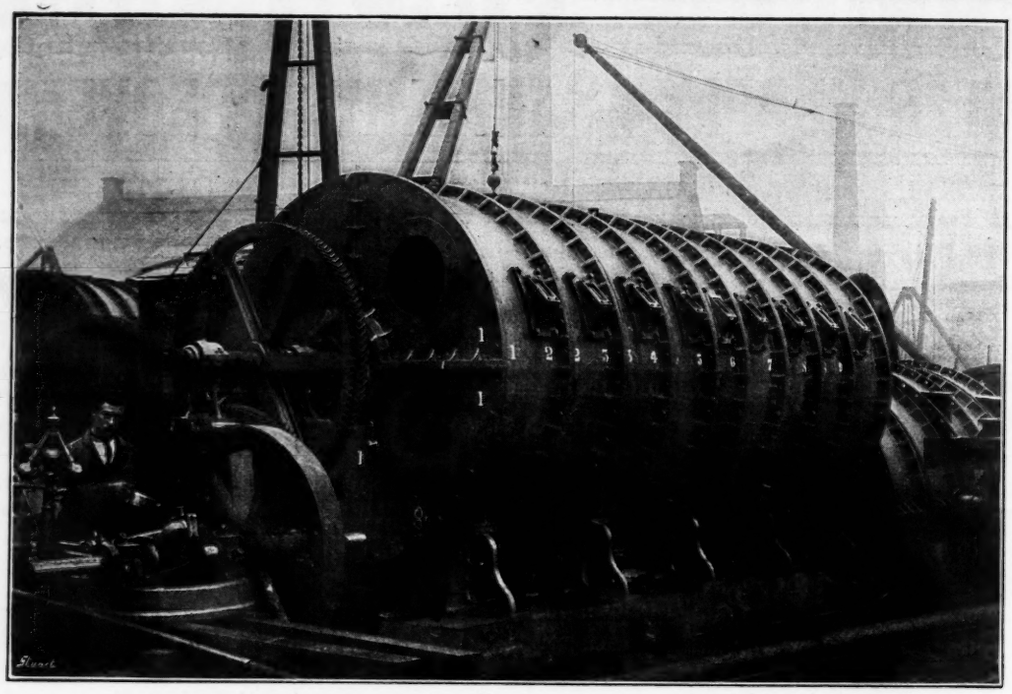

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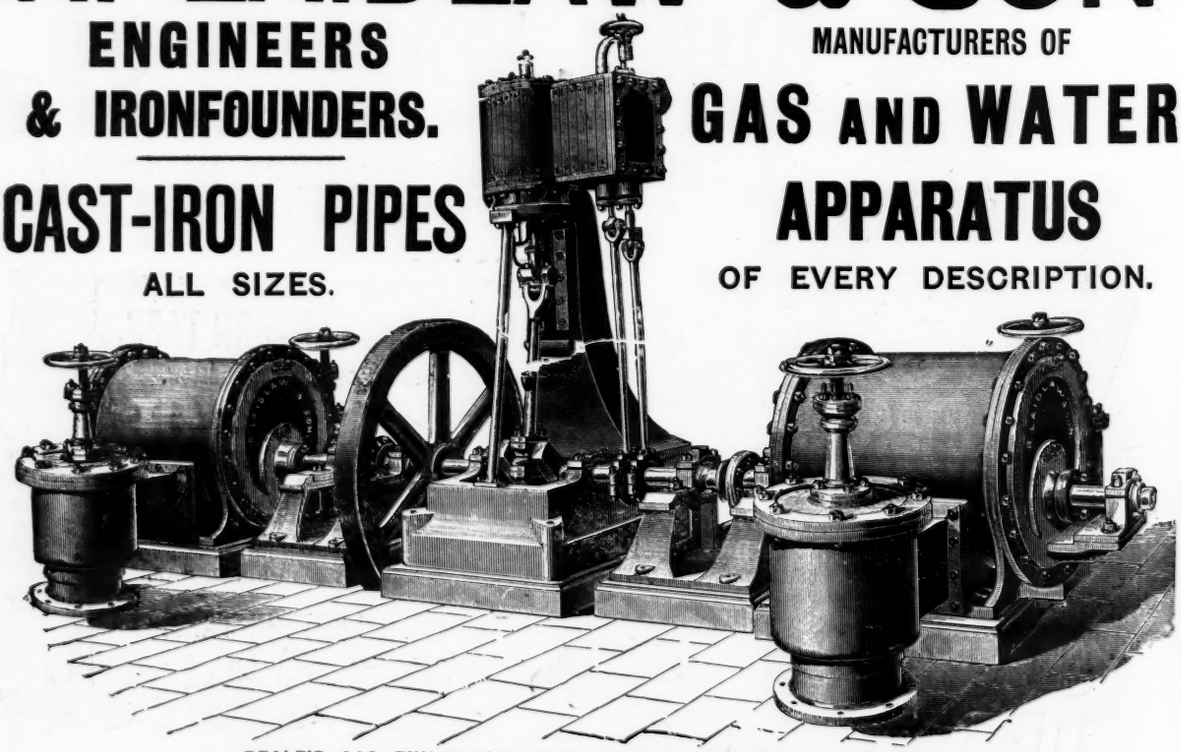

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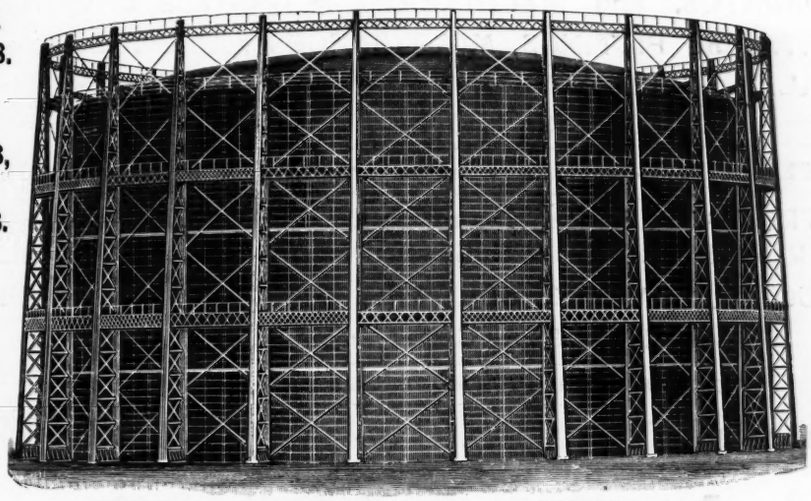

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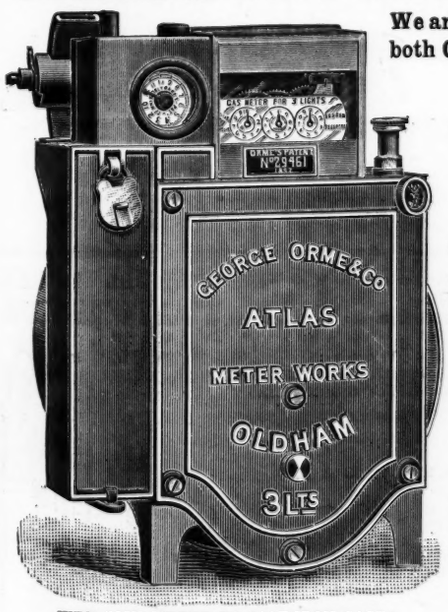

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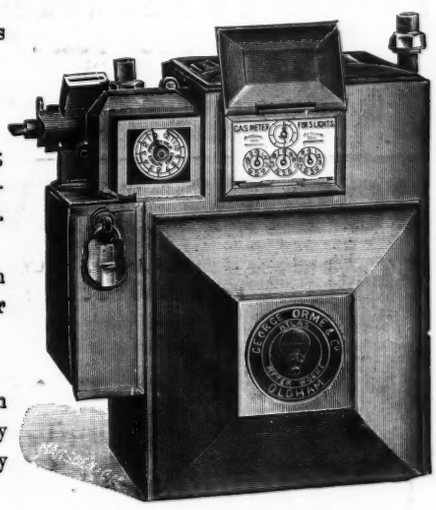

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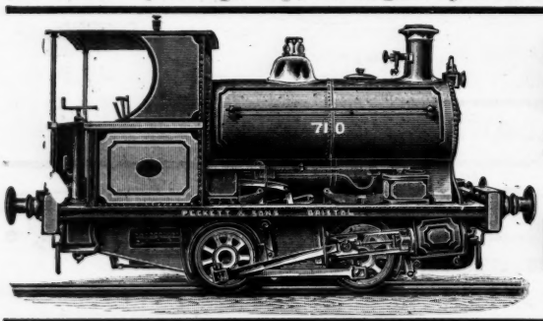

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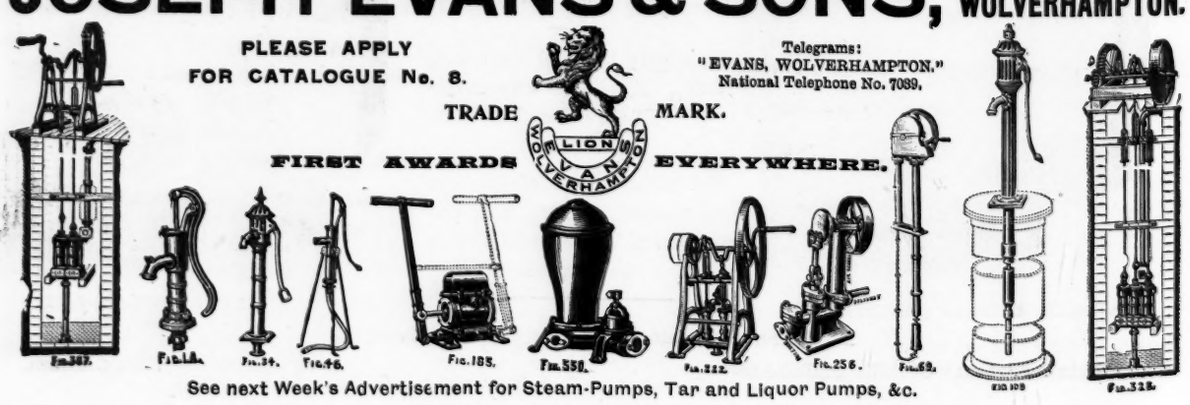

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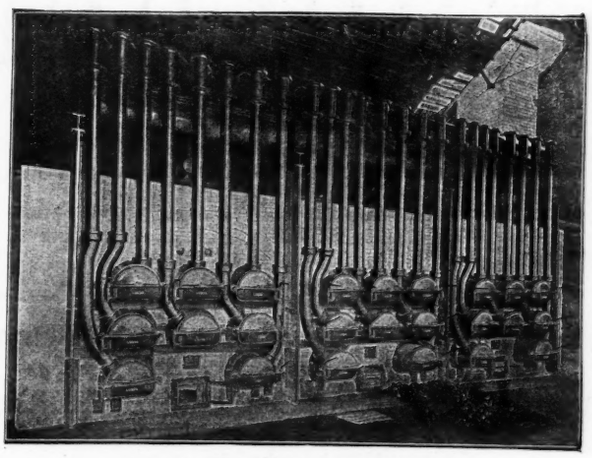

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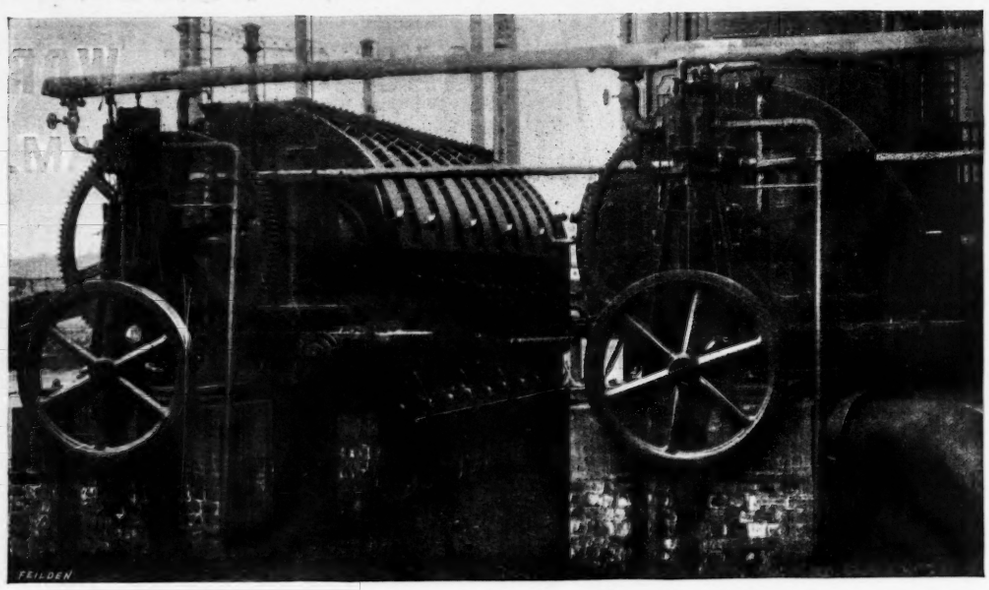

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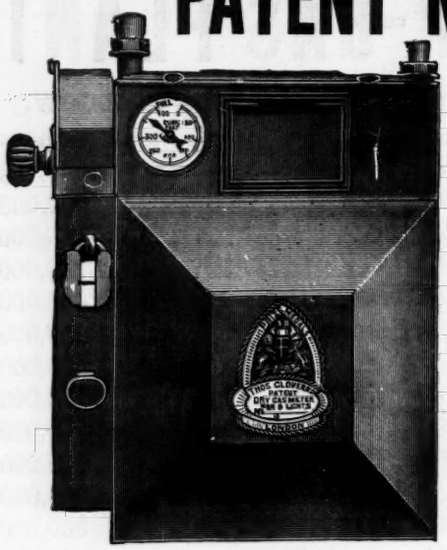

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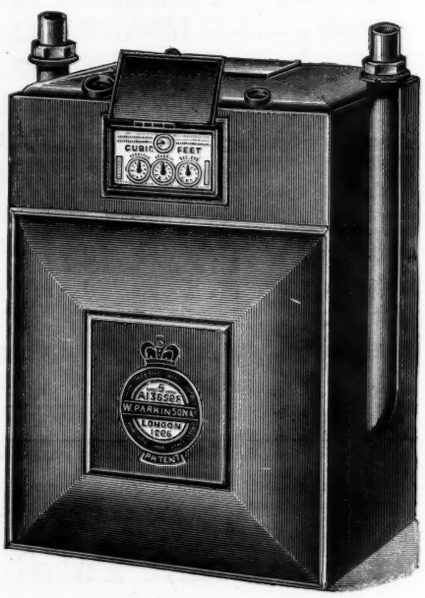

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EDITORIAL NOTES.

A Plea for the Promotion of the Fittest.

THE address delivered to the students of Glasgow University last Friday by Lord Rosebery—Lord Rector to the University and "Orator to the Nation"—contained many words of wisdom that might with advantage be studied and remembered by all engaged in the every-day business of life, whether in positions of command or of those of the rank-and-file. One portion of the address is indeed of especial interest to "JOURNAL" readers, as therein Lord Rosebery laid stress upon two points to which attention has been recently called in these columns—the shortage in first-rate men, and the need for using those we have while they are in the first prime of their powers and energy. It is true that we have referred more particularly to the falling short of the supply of men of the first class in the profession of gas engineering, whereas Lord Rosebery had in mind both the administrative departments of the Government and the commercial undertakings of the country as a whole. That, however, only renders the more interesting the coincidence of his addressing himself to the subject at the present moment. It may, further, provide some poor consolation to those engaged in the gas industry, as showing that the difficulty is not confined to their profession, but is, in the opinion of a very acute observer of men and matters, one to be faced in the immediate future by the nation at large.

Of one thing, said Lord Rosebery, we can at least be certain in regard to the century whose dawn is now close at hand, and that is "that it will be a period of keen, "intelligent, almost fierce, international competition, more "probably in the arts of peace even than in the arts of "war." To this fierce competition in trade the nation is (speaking broadly) as yet but partially accustomed. The rise of other industrial powers of the first magnitude has not made its effects sufficiently felt to bring about the adjustment of methods and policies necessary to enable our industries to completely hold their own. We have yet to fully realize that it is with the keener and more developed intelligence of humanity, stimulated by the struggle for an economic existence, and enhanced by training, that we have now, and in an ever-increasing degree, to vie. "This "conflict," to put into Lord Rosebery's words our previously declared opinion, "we have no reason to fear, if "we choose to rouse ourselves. We have the best natural "material in the world. But it is doubtful if we are sufficiently alive to the exigencies of the situation. It is, "perhaps, well to revel in a sunburst of prosperity and of "high wages. It may be well to owe much of that prosperity to an unbounded exportation of coal, of which "we have a large but limited supply, and which is vitally "necessary to us as the element of existence. It is well to "be convinced that we are the finest fellows on earth, "and supreme on the seas. If that be the truth, it is "comfortable enough; but the mere exhilarating impression is scarcely sufficient."

There is, as Lord Rosebery added, no disparagement implied in this contention for self-examination, this pointing out of the difficulties of the tasks before us. It is but a warning against "the heedless self-confidence of "strength" which is so characteristic of us as a nation—leading us to under-estimate our tasks, and to pay dearly for our lack of foresight, even though we ultimately "muddle through somehow." The English people have been too prone to construe literally the second half of that wise saying of Balthasar Gracian's, that "what is easy "ought to be entered upon as though it were difficult, and "what is difficult as though it were easy." That is, they have not only entered upon the difficult task with as high a spirit and courage as if it were easy, but have believed it actually to require no special preparation or effort.

The point is, then, that if we have in future to contend with a competition directed by those whose intelligence is being continuously developed and sharpened, we must make sure that the intelligence of those who have to contend for our industrial existence is as rapidly developed, and as wisely trained, for the task to be undertaken. Our educational methods must be looked to and adjusted to meet the exigencies of the future. We must take stock of ourselves and, when we find, remove the "weaknesses and "abuses and stagnation" that most surely exist. This is a lesson that should be taken to heart not merely by the

nation as an entity, but by each individual industry. Who will make bold to say that it is not much needed to be learned by those with whom we are most concerned—the responsible heads of the gas undertakings of the country? Which is the truth: That first-rate men are becoming non-existent in the profession, or that the need of discovering and selecting them, and them only, for responsible office is not fully appreciated by the powers that be? Has the fact that the gas industry has to encounter competition which is growing daily closer and fiercer been adequately realized, or is it true that there are still directorates that affect to believe or act as if it can be safely and wisely ignored?

We would ask yet another question: Is Lord Rosebery's account of what happens in the commercial world recognized as strictly accurate by those who know the inner working of some gas undertakings of the first magnitude? (We say nothing about other industries, though we think the description of our general business methods somewhat flattering. If it be not, foreign competition will not long do us injury.) He said: "A business in these days can "live but a short time on its past reputation. . . . A "business house in the present day looks over its managers "and its agents, and considers whether they continue to "be efficient. It surveys its methods, and compares them "with those of its rivals. It discards those which are "obsolete, and adopts all improvements. If it does not "do this, it is doomed." Has that fact penetrated to all the supreme councils of the gas industry? Speaking of our national apathy and self-satisfaction, Lord Rosebery said: "This fatal complacency is so ingrained that some "despair of a remedy until we are awakened by a national "disaster." That sentence needs but verbal amendment to make it fit institutions of less magnitude than the British Empire. Lord Rosebery's address was evidently designed to put the nation in a mood of self-questioning. We have attempted to indicate some of the questions which it suggests to us, and which are surely worth the answering by the profession whose true interests we have at heart.

The New Bill of the Gaslight and Coke Company—Retirement of Mr. Trewby.

Last Friday's "London Gazette" contained the Parliamentary Notice of the intended application by the Gaslight and Coke Company for further capital powers. The new Bill will differ from the old ones in proposing a different standard price for gas and sliding-scale to be applicable to the calculation of dividends payable on the fresh capital. Particulars of the subject-matters of the notice appear elsewhere. New provisions are indicated, having for their object the creation of a redemption fund to be used and applied by the Company for the purpose of effecting a reduction in the aggregate amount of the capital of the Company entitled to dividend. These later proposals—obviously intended to show respect to the recommendations of the Powers of Charge Committee—will receive the respectful attention they deserve. It is never too late to mend; and nobody will wish to be hard on the belated repentance of the Horseferry Road in this regard. Nothing more can be said about this part of the London Gas Question until the text of the Bill appears. Then everybody will be free to form an opinion on the merits of the new legislative scheme of the Company.

Meanwhile, a serious criticism on that part of the affairs of the Company which a Parliamentary Committee have already confessed their inability to touch—the quality of the administration and management—has been published by the "Engineer" as an editorial article. It cannot, therefore, be truly said that the strictures on the Horseferry Road on these accounts emanate from a small or an uninstructed section of the public or the Press. Everybody, outside the oligarchy, who looks into the matter comes to the same judgment. It is, in gas, the parallel to the scandal of the old South-Eastern and Chatham and Dover Railway Administration. Who must die, or retire, before a new broom will be brought into play?

The question is an apposite one just now, by reason of the fact that Mr. G. C. Trewby is retiring from the high position he has held so long, with such personal honour, in the Company's service. The lamented death recently of Mr. Trewby's right-hand man, Mr. Randall, makes, with this additional change, a big sweep of the Company's head-quarters engineering advisers. The immediate question of who is to succeed Mr. Trewby, although deeply interesting and a matter of enormous importance, is overshadowed by that of what the new man will be able to do when he is appointed. It does not matter who dances on the public platform, while the same hands pull the strings. The general Court of Directors have been appealed to, even remonstrated with, in the endeavour to stir in them a sense of the responsibilities of their office. In vain. They seem perfectly satisfied with things as they are. The largest gas undertaking in the world continues to be run by a set of professional Directors, with fortnightly Board meetings, and as a side-show to any number of other concerns, big and little. Consequently, the shareholders have to put up with less dividend than they would otherwise receive; and the public pay much more for gas than they ought. The proprietors will be lucky if they do not suffer still more before the slate is clean. If the Directors wish to impress Parliament with a sense of their solicitude for the interests of the undertaking and the public, they will now informally agree to a self-denying ordinance, and put the Administration of the Company into commission. This could be done without any alteration of the law. All that would be required would be to make choice of some Administrator in whom the world has confidence, give him a free hand and all the Directors' fees; and let a legal number of the Board remain to register his decrees. This appears to be practically what is done now, so far as the working of the Board is concerned; with the notable difference that the present heads of the business are hopelessly discredited. This "*quasi*-Department of State" is, in the eyes of the public, like the War Office itself at the present time; and nothing short of root-and-branch reform will satisfy public feeling in regard to it.

Coal Miners and Coal Prices.

The action of the South Wales Miners' Federation in initiating a policy of output-restricting holidays, to which reference was made last week, has been, we are glad to observe, promptly repudiated and protested against by the representatives of the coalowners on the Sliding-Scale Joint Committee, which met this day week. At that meeting the owners' delegates handed the men a resolution declaring that they (the owners) were "unanimously of opinion "that the principle involved in such a stoppage of work "was unsound and the action illegal, and would not achieve "the object which the workmen's representatives had in "mind; the course followed—so far from assisting the "trade—being calculated to damage it both temporarily "and permanently." On the men's side, however, no signs of repentance or appreciation of the true results of their action were apparent; their representatives, in fact, requesting, and obtaining their request, that the Coalowners' Association would fix a day for the discussion of the wisdom of their adopting in conjunction with the miners a fixed policy of maintaining prices by restricting output.

The men, we read, declared that the matter was one which had better be "tackled" at once, "so as to demonstrate the "power of the miners to those who were endeavouring by "artificial means to influence the market for their own selfish "ends." What a magnificent example of the pot casting aspersions at the kettle! Who would think that the whole aim and object of these preachers of unselfishness was to force the public to pay extortionate prices for coal in order that they might pocket abnormally high wages? The "artificial means" by which the wicked buyers of coal are seeking to influence the market for their own selfish ends is, if you please, that of "keeping back contracts in the "hope that prices will come down!" What an unheard-of atrocity! One has scarcely patience to consider such childish but dangerous nonsense. No wonder that the men who can use these arguments fail to see that if it be only possible to maintain the rate of wages by reducing the amount of work done, the total earnings will not be benefited even temporarily, and will be seriously damaged permanently. But, as we have said, these men appear to be impervious to reason, and will have to buy wisdom, as they will not learn it.

The action of the Welsh miners is, indeed, an omen of serious trouble to come. We have often expressed, and see no cause to banish, the fear that the prolonged spell of extraordinarily high wages now being enjoyed by the coal miners will have the effect of making these men completely dissatisfied with the rates of pay ruling in more normal times, and that they will, in fact, decline to go back to the lower rates without a struggle. The situation certainly invites discussion as to the wisdom of the policy of granting unlimited increases in wages according to the selling

price of coal. The sliding-scale works very smoothly so long as the slide is upwards and a man's earnings are increasing from (say) 30s. to 45s. a week. But when the slide is downward, and the family that has got itself used to spending 40s. a week (and how many would save even the five shillings?) has to draw in to the extent of half a sovereign in the weekly expenditure, the advantage of the system is not so obvious to the miner.

It may be urged that the sliding-scale system is one of profit-sharing, and for that reason commendable. But the business of coal mining and selling is not one in which a bonus calculated according to the selling price of the article produced can be said to be consciously earned by the workman; and such a bonus is, therefore, no real inducement to improved working. The question as to whether, or to what extent, a miner's wage should vary with the selling price of coal, is a difficult one to determine; but it will be much in evidence in the near future. As to the present, it is happily true, as Mr. Livesey points out in a letter to "The Times" (reproduced elsewhere), that there is no prospect of the action of the Welsh miners having any effect in checking the downward movement in the price of coal. Apart from this action, there is, indeed, every cause for expecting an increasing output. Employment in the iron and steel trades is steadily becoming more precarious—the percentage of unemployed at the end of October showing a sensible increase in those trades, and also, on the average, in all others, as compared with either last month or last year. There will, therefore, be undoubtedly an influx of labour into the coal mines, with a consequent increase in output. It is worth noting, also, that the output in Prussia—one of our biggest customers of late—has increased by nearly 9 million tons in the first three quarters of this year, as compared with that period of 1899. Another item of foreign news bearing on the coal situation is from St. Petersburg, and is to the effect that the iron trade is so depressed in Russia that nearly all the works have had to reduce their production.

The evidence of the approach of a considerable fall in coal prices may, in fact, be said to accumulate from day to day. The latest proof that we can lay before our readers is that Yorkshire gas coal has been bought for delivery to a Suburban Gas Company for just over 16s. a ton—which is lower than was the f.o.b. price of gas coal not so long since. We may therefore expect soon to see gas itself marked down again in some parts of the London district.

The Meeting of the Southern District Association.

THOSE British gas managers who have been tempted of late years to adopt a pessimistic view of local technical societies, may take example and draw encouragement from our record of the proceedings at last Thursday's meeting of the Southern District Association. The gatherings of this Association, as of others, have occasionally caused the judicious to grieve over a small attendance and an indifferent programme. This time, however, the able and popular Honorary Secretary (Mr. J. W. Helps) was happily successful in procuring a sufficient and attractive list of three papers, which promised ample technical matter for a long November afternoon. And they were thoroughly appreciated. This consideration will doubtless be regarded by the authors as good payment for their trouble in writing their several papers, which were all, in their manner, excellent. The absence of the President of the Association (Mr. D. Irving, of Bristol) was regrettable, both in regard to the fact and also for its cause—the illness of his respected chief, Mr. W. Fiddes. To return, however, to the meeting. It is gratifying to find that a promise of ample and suitable mental fare is yet a sufficient attraction for a large number of the members of a District Gas Managers' Association. Secretaries and ordinary members should mark the fact, and take its lesson to heart. Another lesson of Thursday's success is that there must everywhere be a reserve of good material for instructive and interesting papers in any body of working gas technicians, which unfortunately lies hidden away, mainly because of the reticence characteristic of English men of affairs. The men who do things, and do them well, hate to talk about them, as a rule; and the most difficult of the duties of Secretaries of Technical Societies is that of penetrating through this crust of personal modesty, and drawing out the good stuff that lies beneath it.

Mr. G. P. Lewis's paper on purifier construction turned out to be a suggestive criticism of the water-sealed and dry-jointed patterns of this order of gas-works plant, to which was added a short excursus into the chemistry of the purification process. Of course, one does not wish to criticize with "all severities" a little technical memorandum of this kind, prepared in good-natured compliance with a request of the Secretary. It is not, therefore, with any other intention than that of offering a little hint for the guidance of future writers on this or kindred subjects, that we remark that, for a necessarily short paper, Mr. Lewis attacked too much. The design and construction of purifiers; the ways in which labour in purification may be economized; the simplification of valves and connections—there is plenty of material for any number of short papers on the structural aspects of purifying plant alone, to say nothing of the chemistry of the process, which is another story. By the way, what an admirable paper might be written for a technical society on "The Hydraulic Seal "in Gas Engineering: Its Uses and Abuses." Many suggestive observations are to be found scattered through the discussion on Mr. Lewis's paper.

Mr. F. G. Cockey's paper descriptive of exceptional difficulties encountered, and overcome, in the construction of a concrete gasholder tank at Newport (Isle of Wight), is a model of its kind. Remarkably well written, terse, clear, and comprehensive, it will be an indispensable memoir on the subject, to be got by heart by all students of gas-works construction. Certainly, no future handbook on gasholder tank construction will be complete without it. Speaking critically of the considerations mentioned by the author as determining his choice of concrete in preference to a steel tank, it can hardly be agreed that they justify his selection—that is to say, it is not to be allowed to go forth without demur that a steel tank cannot be made stiff enough to resist any unavoidable ground pressure without much additional expense. Rolled joists are not dear; and where there is rotten ground to be negotiated, the argument for avoiding all risk by going in for steel throughout is very strong. If Mr. Cockey had decided in this sense, he would have escaped much worry; his faithful contractor, whose staunchness in trouble deserves honourable recognition, would have kept his money; and the Southern District Association would have gone without a valuable communication.

Mr. A. W. Onslow's paper on incandescent gas lighting by means of high-pressure gas had all the advantages of "actuality." Indeed, it might almost be styled "topical," so active is the movement in this direction at the present time. On all hands, with the drawing-in of the winter days, people with shop work to do and highway authorities are rushing after high-power incandescent gas-lamps, which have the advantage over electric arc lighting of being available at short notice, wherever a gas-pipe goes, and a source of small power is available. Knowing all this, however, it nevertheless came with something of a shock to hear that Mr. Onslow, being at the Woolwich Arsenal in the exceptional position of gas manufacturer and consumer on a large scale, has already gone the length of burning gas at the unprecedented pressure of 54 inches of water. He told his story in a plain, matter-of-fact style, which deeply impressed his audience. Just imagine it for a moment! At a period when the idea of supplying gas for high-power lighting at a pressure of 8 inches of water, or thereabouts, is being handled gingerly by a few "advanced" gas engineers in the ordinary line of business, here is a technician pure and simple, who has no other obligations than those of making 350 million feet of gas yearly at the lowest cost, and lighting 25,000 men to their work as cheaply as possible—and he puts a smith's blower on a service-pipe, and with no other appliances runs the burner pressure up to 54 inches. He expresses himself as ready to go to 180 inches of pressure, if he can get burners and mantles strong enough to stand it. Of course, there must be an economic limit to this daring; but that will have be ascertained. Nobody knows anything about it yet. This question belongs to an entirely new department of gas lighting that is only just being opened out. The gas company engineers and managers who listened to Mr. Onslow last Thursday could say nothing to his point, for the simple reason that their studies and practical experiences have not hitherto lain in this direction. They will have to pick up the subject quickly, however, with electric light, municipalized and otherwise, dazzling the world around them. If, with all these leads, the gas managers of the United Kingdom allow the new opportunity of usefulness to their generation and industry to slip,

they will deserve all the hard names that a business world, innocent of the somniferous influence of statutory protection, has ever applied to their order. Such a breezy person as Mr. Onslow—a Gas Engineer with neither a board of directors nor a municipal committee to reckon with—is infinite refreshment in a stuffy environment of dividends, and gas profits, and "ordinary gas-works routine." It was worth a long journey to hear him on Thursday, and to handle a model blower he had with him—a toy which, as he said, was capable of creating a blaze of light in the meeting-room. And he would have done it, too, if there had been the smallest facility for the operation! That is the spirit we should like to observe more frequently in the gas engineer of to-day.

The "Corner" in Oil and its Results on the Gas Industry.

One of the most valuable lessons taught by the year's "tightness" in coal is that of the folly of relying upon carburetted water gas as a second string for the British gas manager's bow. We welcomed the advent of carburetted water-gas manufacture into the United Kingdom in the capacity of an auxiliary to the ordinary coal-carbonizing plant. It was talked about for many years before it came, and it was demonstrated that the prospects of its coming depended altogether upon the price at which the necessary oil supply could be obtained here. The time came when the requisite proof of the reduction in the price of gas oil seemed to be completed. At the first meeting of the Incorporated Institution of Gas Engineers, Mr. G. C. Trewby (the President) dealt in his Inaugural Address with this aspect of the question of carburetted water gas. At that period—May, 1891—although the price of oil in this country was admittedly too high (3d. per gallon for Solar distillate) to enable carburetted water gas to be made here in competition with ordinary coal gas, there was just an economic possibility of using it as a means of enrichment. This was also the period when cannel coal was being advanced in price; and the gas companies, led by the example of Beckton, were attracted by the promise of being able to show the cannel coal merchants a Roland for their Oliver, in the shape of carburetted water gas enrichment at a cost of about 1s. 10d. per 1000 cubic feet for 25-candle gas. When Mr. Trewby made himself responsible for this estimate, he had taken pains to learn what were the prospects of getting even cheaper gas oil; and he made public the assurance he had personally received "from a "gentleman who is fully qualified to speak on the ques- "tion of the petroleum industry," to the effect that the supply might be regarded as unlimited. He certainly believed then that, as the demand for the material for gas making increased, the price would come down.

All over the country, after this, gas managers began to think hopefully of this possible "second string." It was introduced in many works favourably situated for getting the oil at a low cost for carriage, sometimes with the express object of reinforcing the coal-gas plant in respect of the bulk of the output—not merely for carburetting. The oil did become cheaper for several years; and we, among others, fell into the delusion that this effect was traceable to the ordinary operation of the economic "law" of supply and demand, in cases where the supply is practically unlimited. It became a commonplace of gas politics that coal prices would never be able to affright the poor gas manager again, because the course of the oil market would be independent of that for gas coal. Probably the careful student of these pages might be able to disinter from not very old volumes of the "Journal" several articles setting forth this view with conviction. Alas! for confidence in the "law" of supply and demand! We should not like to say how much more gas oil is bought and sold now as compared with the volume of trade in those years of hope; but at least one thing is certain—the price of the commodity has gone up to a figure at which it would never have wormed itself into the British gas manager's young affections, if it had always been so in the early '90's.

During the past year or two, those gas companies who had equipped themselves with auxiliary carburetted water-gas plant have been pretending very hard that they liked it. The oil always grew rather dearer, instead of becoming cheaper; but still they clung to their acquired taste for its gaseous product, and refused as long as they could to be disillusionized. Then, when the pinch of scarce and dear coal came, they hugged themselves with the fond belief that now their superior husbandry would become manifest. "Let the galled jades wince; their withers "should be unwrung!" And they began to look out sites for more carburetted water-gas sets. But they reckoned quite without their hosts. The magnates of the oil market calmly informed their customers for the gas-making varieties of the commodity that the prices must be increased. Why? Because of any heightened cost of the raw material, or of freights? Not to any notable extent. Everything has, of course, grown dearer of late—everything, that is, which has much to do with coal or iron. But it is not pretended that oil has cost sensibly more to get to British ports. It ought to be cheaper, if the recent opening of a long length of Caucasian pipe-line possesses any economic significance. No; the advance in the price of oil is a deliberate "squeeze" on the part of the controllers of the situation. They have the effrontery to tell the buyers of gas oil that these victims of inflated coal prices can afford to pay more for their oil also; and they mean to make them do it. There is no political economy or fair dealing in the matter; it is sheer "cornering."

It has come to this: There is no knowing what to expect as regards the course of oil prices from knowledge of the opening of new pipe-lines, the exploitation of new fields of supply, or anything else. There must somewhere be a hierarchy, which holds the market in the hollow of one hand, which can within wide limits be opened or shut at will. If we had suspected this eight or nine years ago, we should have counselled the exercise of the greatest care by gas managers everywhere in weighing the advantages of auxiliary carburetted water-gas plant, and, among other things, the charging of the capital cost to a seven years' suspense account. The oil cornerers have spoilt the prospects of carburetted water gas for this country. They may have acted in this sense intentionally, out of a desire to keep their oil for other markets. That is best known to themselves. The movement in favour of carburetted water gas in England during the past decade is not to be regretted. Still less are those who took part in it to be blamed. On the contrary, the movement came just in time to prevent the distress into which dear cannel would otherwise have plunged most of the gas undertakings of the kingdom. Now it would appear that the preventive has served its turn, and threatens to become a burden. The need for enrichment of common coal gas is passing away. The South Metropolitan Gas Company resisted the fashion of carburetted water gas until the day for it had gone. Now it stands confessed a remedy that has everywhere grown worse than the disease it was to have cured. True, many gas companies are as slow in giving up a practice as they are in adopting a new one; but the fresh leaf has been turned in all the carbonizing books, and the entry on account of carburetting materials of all kinds will grow smaller every day. The cheap gas of the future will be made without oil; and the oil merchants seem to be quite willing to have it so.

Gas Prices at West Bromwich.

A very interesting polemic has been going on in West Bromwich over the prices of the municipal gas supply. It appears that some time ago—not very long—the Corporation Gas Committee were desirous of encouraging the day demand for gas; and accordingly they made the handsome offer to local manufacturers of a sixpenny reduction on the charge for all gas above a certain quantity used in the production of motive power. The ordinary price of town's gas was at the time 2s. per 1000 cubic feet; so that the prospective users of large quantities of gas for power would get it for 1s. 6d. per 1000 cubic feet. It was exceedingly awkward for the Gas Committee that, almost as soon as this arrangement had been put into force, the rise in coal prices compelled them to increase the price of gas all round. What they did, however, under this compulsion was to increase the price by 2d. only to the ordinary consumer, while putting up the price of power supplies from 1s. 6d. to 2s. per 1000 cubic feet, which looked very like withdrawing the whole of the inducement offered to the manufacturers to change from steam to gas power.

Naturally, the alteration was a subject of complaint, both inside and outside the Corporation. It was claimed that the increase in the price necessitated by dearer coal ought to have been made equal all round. At their last meeting, the Town Council conceded the justice of this view by making the price of power gas, for quarterly quantities of 1 million cubic feet and upwards, 1s. 9d. per

1000 cubic feet; while retaining the other supplies at the advanced price of 2s. 2d. per 1000 cubic feet. Very remarkably, this correction was strongly opposed by Mr. Bushell, the Chairman of the Gas Committee, who spoke almost passionately against it at the Town Council meeting. We are tempted to ask whether Mr. Bushell was the Chairman of the Committee at the time when the original remission of price was made in respect of power gas. His point now is that, even at the price of 1s. 9d. per 1000 cubic feet, the gas will be sold to a particular class of consumers under cost price. This proceeding he stigmatized as commercially unsound. The opposite view was upheld by Mr. Wilson, an equally eminent and able local man of business, who argued that it would pay to sell power gas at the figure named, because it would be made at a time when the plant would otherwise be idle. Even at the advanced price of coal, it only costs 1s. 2d. per 1000 cubic feet to put gas into the West Bromwich holders; so that there is plenty of margin between the actual cost and the price charged for power gas. The difficulty here is chiefly one of definition. What is the cost price of gas? Mr. Bushell's position is, in its essence, unassailable. No corporation product ought to be sold at under cost price, because to do so is to benefit pecuniarily one man at the expense of another. But, on the same ground, no corporation product ought to be sold above cost price, and the so-called profit appropriated to the relief of the rates.

If the question is one to be argued on this high plane of municipal ethics, well and good. In the present case, however, to do so appears to be a trifle late in the day. This should have been done when the original departure from uniformity of charge was made. Thereafter, the issue was lowered to one of practical politics and ordinary commercial good faith. Corporations must keep their word in the spirit as well as in the letter. To make a bid for non-existent custom, and then run word, is not business, nor even common honesty. It is idle, in the circumstances, to pose the question of the fairness of giving a discount for power gas consumed in large quantities. Some gas undertakings do; others do not. It is usually done, if at all, where the uniform price of gas is distinctly high, and the object is to get down to a lower uniform rate. In West Bromwich, gas is not high priced for any class of consumption; but if the extensive use of gas-engines in the borough can be encouraged by offering a concession of 5d. per 1000 cubic feet to manufacturers, it would be extremely difficult to make out a convincing case, on strict ethical grounds, for denying the community such a boon.

WATER AND SANITARY AFFAIRS.

THE liability of frail humanity to occasionally fall into wrong-doing is a weakness which calls more frequently for pity than punishment. It is deliberate persistence in wrong-doing that is reprehensible. And this is precisely the present attitude of the London County Council on the Metropolitan Water Question. Notwithstanding the unequivocal terms of the report of the last Royal Commission, the Council last Tuesday, by a majority of 28, decided to promote a Bill to sanction the purchase by them of the undertakings of the Water Companies. This conclusion was come to on a report by their Water Committee in which, as pointed out last week, they candidly confessed that the course they recommended might be unsuccessful. The general opinion is that it will be; for even one of the Council's own organs admits that it is "one thing to introduce Bills and quite another to pass them." Moreover, when the Chairman of the Committee was asked the plain and straightforward question whether he conscientiously believed there was "a ghost of a chance" of such a Bill as was proposed being passed, he preferred to remain silent. Consequently, it may be expected that the £25,000 estimated to have been fruitlessly spent on this matter will be increased by another £200. Mr. Stuart thinks the money has been well laid out; but we doubt whether the ratepayers will be disposed to agree with him. We shall probably hear something from them at the election early next year. Two reasonable propositions were submitted by the Moderates—one, that the Council should promote a Bill to give effect to the main principles of the report of the Royal Commission; the other, that no more money should be spent on Bills, but that the Government should be pressed to legislate on the subject next session. Both, however, were rejected. The Committee's recommendation was sharply criticized during the debate to which it gave rise. Mr. Whitmore predicted failure if the Council were so "perverse" as to adopt it; while a Progressive was bold enough to confess that he failed to see much use in "knocking their heads against a brick wall," and with a touch of resignation he likened himself to "a lamb being led to the slaughter." The action of the Council may be regarded by the "thick-and-thin friends" of that body, as the "Pall Mall Gazette" calls them, as a firm determination to maintain their policy of purchase; but others will look upon it—to quote our contemporary's language—as "pigheadedness."

The first Mayor of the new borough of Marylebone—Mr. Edmund Boulnois, M.P.—had not a great deal to tell the proprietors of the West Middlesex Water Company, of which he is Chairman, at their half-yearly meeting last Tuesday. The talk about the possible purchase of the water undertakings does not lead the Directors, any more than those of the other Companies, to sit with folded hands waiting to be bought up. He consequently emphasized the statements in the report as to the progress of the works. Only half-a-mile is unfinished of the new 42-inch main from Hampton to Barnes; while two new filter-beds have been completed at Barn Elms, and a third will, it is expected, be ready by the end of the year. These works have been undertaken solely with the view of making the supply more efficient in quantity and quality. A constant service of water is now afforded in 83,200 out of the 86,247 supplies connected on the 30th of September. Building is going on so fast in the north-west of London that the Company's limit will soon be reached. However, they will be in a position to meet the increased demand for water, as they are one of the three Companies engaged in carrying out the Staines reservoirs scheme, with which great progress has been made; one of the two large reservoirs now in course of construction, the combined capacity of which will be 3300 million gallons, being nearly completed. Referring to the action of the Water Committee of the County Council alluded to in the preceding paragraph, Mr. Boulnois stigmatized it as "a wanton proceeding," and expressed the belief that the House of Commons would summarily reject any Bill which was not based upon the recommendations of Lord Llandaff's Commission. Apart from the prospect of another tussle with Spring Gardens, the only cloud over the Company at the present time is their dispute with the Official Auditor (Mr. Allen Stoneham) to which reference was made in the "JOURNAL" for the 6th inst., and another difficulty which has arisen in connection with the payment made to the Chamberlain's fund in respect of the first issue of debenture stock under the Company's Act of 1894. The Directors are naturally anxious to get these two matters arranged, as, until they are satisfactorily settled, no further dividend can be declared. However, for the past half year the proprietors receive one at the rate of 10 per cent. per annum; and it may be hoped that the existing obstacle to its continued payment will be speedily removed.

Apart from the various projects connected with the supply of water which will come before Select Committees next session in the form of Private Bills, the number and scope of which will be definitely known in the course of the present week, indications are not wanting that Parliament will be asked to deal with two matters which are recognized as of primary importance to all who have the management of water undertakings. We refer to the control of watershed areas and the law as to underground water. Both the County Councils Association and the British Association of Water-Works Engineers now have this matter under consideration; and the outcome of their combined deliberations will probably be the submission to the Local Government Board of some scheme as a basis for legislation. We need not again enter into the merits of the first question, which has already been dealt with in the "JOURNAL." With regard to the second, when a leading Queen's Counsel characterizes the existing law in regard to it as "simply silly," it would seem that the time has come to set about altering it. A good deal of attention has been bestowed upon this subject of late—Lord Robert Cecil discoursing upon it at the Temple, Mr. Shiress Will following at the Surveyors' Institute, and quite recently Mr. Mansergh at the Institution of Civil Engineers. As is perfectly well known, the law, as it at present stands, does not recognize any right in underground water, unless it can be proved to be flowing in a defined channel. This

it is somewhat difficult to do. The operation of such a law inflicts hardships in many ways. Mr. Shiress Will freely admits this; but, notwithstanding all the study he has given to the matter, he cannot see how the law is to be altered with justice. The Lawyer having, on his own confession, got into an *impasse*, the Engineer tries to extricate him by applying his "non-legal mind" to the solution of the difficulty. Mr. Mansergh suggests that, by some addition to the Standing Orders of Parliament, Committees might be empowered to deal in a reasonable and sensible manner with cases coming before them. He thinks that parties obtaining parliamentary powers in respect of water supply should be allowed a zone, having a diameter to be determined after hearing competent evidence, within which no other well should be sunk for procuring water for public supply outside the defined area; while those within the area should be protected somewhat on the following lines: That those who had spent money in sinking wells or otherwise obtaining water should, if such water were taken away by pumping operations, have a similar quantity supplied to them free; and that those who had not spent money should be supplied at a price to be based upon the cost at which, but for the abstraction of the water, they could have procured it for themselves. Here are two very simple propositions, which merit the consideration of those who contemplate initiating proceedings with the view of amending the existing law on this troublesome subject.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1287.)

THE revival of activity in the Stock Markets was well maintained last week. The feverish characteristics had abated; and there was a marked disposition to settle down into good, steady business. Not that the week was altogether unchequered, and symptoms of a slight check now and then appeared; but they acted as no more than a wholesome break to prevent the pace from being made too fast. After the settlement, the tone ruled very firm, and business continued active to the close. With the sole exception of the Funds (which were troubled with some misgivings as to what the Government may propose as to ways and means), prices pretty well all round had a nice advance; railways in all parts being conspicuously in front. The Money Market was firm at the opening, and discount rates were disposed to harden; but greater ease set in later. There was a good demand for short money for the Stock Exchange and other lines, after which the market was quite slack. In the Gas Market, business was quiet, taken all round. On one or two days, things looked as if they might quicken up a bit; but the promise died away to nothing. The tendency, too, was deadly dull to a degree; and the prevailing weakness was such that stocks fell away directly they were touched. Only one issue had a real advance, and that was rather a partial recovery from the excessive drop it had had in the preceding week. In Gaslights, the ordinary had to give way at last, after a long struggle to maintain a par quotation. On Thursday, it touched 97; but the final mark was half a point better. The secured issues were quite featureless. South Metropolitan was also decidedly flat. On Wednesday, it was marked as low as 125; but the closing figures were better. Commercials were steady, and hardly touched. The Suburban and Provincial group were little dealt in; but British recovered a point. The Continental Companies were as much neglected as the rest, and no stronger. Both Imperial and Union had to recede. Among the remoter undertakings, Buenos Ayres and River Plate were a little lower; but Bombay came out better on *ex div.* adjustment. The Water Companies were quiet, and without any change in quotations; the market not taking fright at the outrageous resolution of the London County Council to attack them again in the next session of Parliament.

The daily operations were: Business in Gas was almost stagnant on Monday, and prices were weak. South Metropolitan fell 1, and Union preference 2. Little more was doing on Tuesday; and Gaslight ordinary relapsed 1. The flatness of Wednesday produced a fall of 1 in Imperial. Thursday was the busiest day of the week, but no stronger. South Metropolitan fell 1, and Buenos Ayres and River Plate ¼ each. Friday was quieter. British rose 1; but Gaslight ordinary dropped 1. Saturday was much as usual; and quotations closed unchanged.

ELECTRIC LIGHTING MEMORANDA.

Electricity in Bulk for the West Riding—The Scheme—Report on Polyphase Systems, by Mr. S. E. Fedden—The Systems Approved.

NOTIFICATION has been given of the intention of a strong local combination to seek parliamentary powers next session for the supply of electricity in bulk throughout the southern, or manufacturing, portion of the West Riding of the County of York. The area of the selected region is 1800 square miles, and the population about 2¼ millions. It is divided up, for the purposes of local government, among 17 boroughs and county boroughs, 119 urban districts, and 22 rural districts—altogether, 158 local authorities. Of these, only eleven have works yet established and supplying electricity—some on only a very small scale, and none on a scale sufficiently large to attempt general power supply. Three other authorities have works in progress; while in 18 other cases Provisional Orders have been obtained and are not put in force. The limitations of municipalism in electricity supply could not be more clearly exhibited than they are in this preliminary statement. Obviously, if it is expedient that the district in question should have a general supply of electricity for power and other purposes, only such an organization as is now preparing to get to work can provide it. Besides, all the legitimate claims of existing interests are to be satisfied. The Company will be prepared to act only upon the lines laid down by Sir James Kitson's Committee. Mr. A. G. Lupton, of Leeds, is the Chairman of the Company; and he has explained in the local newspapers that the idea is to deal with authorized undertakers wherever possible, and to supply manufacturers with power. He does not anticipate any opposition from local authorities! Sanguine gentleman! As if local authorities, when inspired with the "sweet reasonableness" that prevails (say) among the present majority of the London County Council, would not oppose a Syndicate of Archangels organized to bring in the Millennium by strictly statutory methods!

Whether or not this West Riding Company will be able to do business with the electricity-supplying local authorities of the neighbourhood, they ought to be able to try crucially the economic and industrial experiment of supplying power on the large scale to manufacturers. The Company propose to put down, in the first place, four main generating stations, each calculated to serve a district with a radius of 8 miles. These will probably be located at Wath-upon-Dearne, between Barnsley and Rotherham, at Methley, on the River Aire below Leeds, at Mirfield, and at Shipley, near Keighley. One would be disposed to remark of this list, that if a scheme of the nature of that contemplated might be expected to succeed anywhere in the kingdom, it should be here. All that convenient colliery sites and adjacent manufacturing centres can contribute towards the realization of such success is assured in advance. The Board of the Company have a perfectly free hand to equip the undertaking with the best plant to be had in the world for the intended purpose. This enterprise, at least, does not savour of the "tied house" system. The Company's Electrical Engineer is Mr. A. H. Gibbings, late of Bradford, who has already proved his mettle. We shall see how the undertaking fares. Those gas undertakings that lie in the scheduled area will have only themselves to thank if the Company, when they get to work in a couple of years' time or so, find in the towns a great demand for electric light as well as power.

Mr. S. E. Fedden, Chief Engineer of the Sheffield Corporation Electric Supply Department, has recently made the round of the industrial Continent, by the instructions of his Committee, in order to gain information with regard to technical matters. The example is greatly to be commended. The ratepayers of most towns are pretty sick of paying for Corporation "deputations" to travel ostensibly in search of knowledge—and to see the more "picturesque" sides of life. It is the purest delusion that a party of miscellaneous shop-keepers can serve any useful purpose by going about, at the ratepayers' expense, to look at gas-works, or electricity works, or any other technical show. It is, therefore, high time that our democratic municipalities recognized another limitation in this respect, and sent their professional advisers abroad while they remained at home to receive the resultant reports. They should remember that it was long ago recognized as true that, in order to bring home the wealth of the Indies, a traveller must take the wealth of the Indies out with him—in his head. Mr. Fedden's report is published in full in the "Sheffield Independent" of the 12th inst. It is worth reading on all accounts, and especially as a presentment of Continental electrical engineering viewed in a particular light.

Mr. Fedden's point was "phase" systems of generating the alternating current. He looked at many things; but the "phase" was his main attraction. He did not find any cheaper electric lighting on the Continent than he left behind; and it does not appear that electrical power from town mains at 2½d. per unit is a very wonderful discovery. Speaking of German lighting generally, Mr. Fedden remarks that, in many places where gas is used for street lighting, they are only waiting for the concessions to expire before adopting arc lamps. He is fain to admit, however, that these same streets are now well lighted by incandescent gas. A little deeper and a further inquiry might have taught him that where both systems of lighting have fair play, it is difficult for electricity to compete with incandescent gas, even at German rates. It is interesting to learn from Mr. Fedden that the immediate future for electric power appears to belong to high-pressure alternating currents of the polyphase type. Polyphase motors commend themselves by their solid construction, and the simplicity of their design. All the incidentals, such as switching and controlling gear, have been greatly improved of late years. Consequently, Mr. Fedden feels reassured in his opinion as to the desirability of changing over the monophase system existing in Sheffield to polyphase. He declares roundly that this is the up-to-date practice. But it will be remembered that there have been other electricians in England who denied this proposition.

THE ROMANCE OF GASLIGHT.

MENTION was briefly made last week of the pleasing fact that the current number of the "Contemporary Review" contains an excellent article on "Gaslight," in which a simply worded, but interesting, account is given of the rise and latest developments of gas lighting. It is not often that the technical critic, who is nothing if not a specialist, can unreservedly applaud the work of a "popular" writer on his own subject. Even such careful writing on engineering matters as that of Smiles occasionally tripped. The "Contemporary" Reviewer, however, as the "Ironmonger" well says, tells the Romance of Gas in language as accurate as it is plain. It is not our intention to reproduce any of the substance of this article, as we are no friends of the fashion of picking out the tit-bits of current literature, and thus destroying the value of the original. Besides, there could not be, in the nature of things, anything in it strange to gas technicians. Suffice it to remark, therefore, that the subject is treated in the manner which is known as the method of evolutionary philosophy; the thread of development from Murdoch to Auer von Welsbach being firmly traced. It is very striking how completely this method of treatment reduces to order and sequence the historic steps of the progress of gas lighting. Now that the tale has been so interestingly told, in so accessible a publication, it is to be hoped that the great world of general readers will know more about the subject than heretofore.

It is impossible to peruse a narrative of this kind without allowing the mind to wander, after the book has been laid down, upon the bewildering thought of the consequential results of those great conquests of individual enterprise—gas lighting, steam railways, the steamship, the electric telegraph. The motive power that drove men to start all these ventures was the simple need of daily bread. They and their successors in business worked from this compulsion first and last; yet what widespread incidental and consequential effects have their operations brought in their train! Murdoch might have made a living at simple millwrighting; and Winsor might have been a stockjobber, like many another. Here is the fatal shortcoming of Communism. But for the insistent pressure of the individual need, who would trouble to bring to the service of the world anything new, which the world, for its part, invariably protests that it does not want?

This is pure Individualism. On the other hand, it is necessary to be upon one's guard against the error of Carlyle's "Great Man" theory of the world's progress. Murdoch and George Stevenson were men of their time. They heard the voice of the age in which they lived, while others were deaf to the particular message they appropriated and acted upon. If they wrought better than they knew, they were also in some sense agents, instruments, interpreters. The vast developments originating in their tentative pioneer work, are not their property. If they had not happened to do what they did, others would have done something very similar—perhaps better, perhaps worse. It is the commonest observation that the individual inventor is not the only requisite element in the composition of the general results appearing as a successful invention. Indeed, his share in producing the general result may easily be, and generally is, exaggerated. Most inventors, who have gained fame and wealth by their operations in one line, demonstrate their limitations by making colossal mistakes in other directions. Even when they can hardly be said with fairness to have blundered, they get into "No thoroughfares"—as Murdoch with steam road travel.

One of the most profitable of studies for young engineers is that of ancient inventions, especially those that came to nothing. The instruction lies in ascertaining why they failed. Murdoch soon abandoned the motor-car enterprise, and so did his contemporary Trevithick. Herein they showed wisdom. To-day, when the endeavour is being made to revive this ancient enterprise, it is usual to blame repressive legislation, and the influence of the rival interests of horse-breeders and railways, for the blight that came upon it after the rather more than experimental successes of Goldsworthy-Gurney and Hancock. Yet a closer investigation of the conditions and the circumstances will bring the conviction that, whatever may have been its motive, the repressive legislation which diverted mechanical engineering from applying steam traction to common road vehicles was beneficial. The Metropolitan Railway is the real development of Hancock's steam omnibuses from Paddington to the Bank. No great success could have rewarded the motor-car inventors of Murdoch's day or later without a radical, and even yet impossible, alteration of the roads. The metal rail is the only road upon which a mechanically-driven carriage can do its best. Whether, after all this time, the modified success which is alone possible for motor-cars on common roads will be enough to satisfy the amateurs of the enterprise, is matter for speculation. Unquestionably, however, the concentration of the attention of the mechanicians of the early part of the century upon the larger possibilities of railway working proved much more fruitful than would have been any amount of devotion to road motors.

Coal gas was one of those discoveries which provide unlimited scope for the operations of the financier, the engineer, the chemist, and the man of business. It never needed a legislative check, similar to that put upon the motor-car enterprise; it would have been impossible to prevent its expansion by any such means. Never having been checked, it has always been growing and developing. Gas lighting, the other uses of gas, the ordinary operations of gas-works, are very different now from what they were twenty, fifteen, or even ten years ago. A modern gas-works is a box of machinery, compared with the simple factory of the seventies, with nothing much more mechanical about its equipment than a wheelbarrow. This is one reason why gas engineering is so much more interesting now than it used to be, and why there is so much more in it. And together with the increasing complexity of the works equipment, there has come about a greater simplicity, so to speak, or at any rate uniformity of product. The gas industry has grown out of the age of ignorance of its elements which furnished opportunities for charlatanry. During that period of its existence, almost anything might be credited as possible. Hence all manner of fancy gases made their appearance, only to deceive the public, and sometimes even those who, from their technical standing, should have known better. The gas-works is no longer a house of mystery, but a place where heavy materials are handled and worked up with the greatest economy and efficiency.

What developments may be expected in the future? That is precisely what no man can hope to predict of any industry. Developments will come; but all experience teaches that they are not likely to be foreseen. Some people hold that inventions and improvements of all kinds of industries can be made to order—that the want has only to be diagnosed, and its supply can be arranged for. This is not true—or true to only a very limited extent. In the first place, it is not possible to be sure that the recognized want is really so. The World of Nature is not like the political world, in which a scheme clamoured for with sufficient persistence can usually be obtained—only for it to be discovered, afterwards, that it was not what was wanted at all. Thus, the politician demands the ballot, or universal manhood suffrage, not because these things are desirable in themselves, but because he hopes they will redound to his advantage. When this hope is disappointed, the charm of the arrangement vanishes. The arcana of Nature is not to be forced in this spirit. The way in which we may be looking for an inlet is, as often as not, a blind aspect. We may find it expedient to try another, apparently hopeless, line of attack, and be astonished to discover that it leads somewhither. Only, it is at least certain that these new conquests are no more to be mapped out from a base of observation, distant in time and detached in interest, than their fresh consequential effects are to be discerned or controlled. The endowment of the civilized world with the boon of organized artificial light, distributed everywhere, available in any quantity, at all hours, was one of the most potent aids to the material and intellectual advancement of the human race that could have been asked for by the wisest of their species, at a period when it had not been offered to the world. No man did ask for it, as a matter of fact. Not one of the sages of the Eighteenth Century, the Age of Reason, perceived the need of it. The Lockes and Humes and Benthams never suspected how vastly public lighting, in the broadest sense, would assist in the culture of the human understanding. It came, when it did come, as an accident of the enterprise of a few people who wanted to turn a little money honestly in a new way.

Such is the complex nature of real Progress in material civilization. Rooted in selfish aims, it brings greater blessings in its train than the schemings after the universal good of the purest philanthropy. Plunging blindly into the unknown, it yet compasses ends that the profoundest prescience never conceives. Every development seems as a starting-point for new outgrowths; and the reward of endeavour is never finality, but encouragement to effort incessantly renewed.

AMALGAMATION OF METER FIRMS.

UNDER the title of "Parkinson and W. & B. Cowan, Limited," a Company has just been registered, to take over the respective businesses of Messrs. W. Parkinson and Co., of London and Birmingham, and Messrs. W. & B. Cowan, Limited, of London, Edinburgh, Manchester, and Sydney. The nominal capital of the Company is £450,000. It is not intended to offer any portion of this to the public, as all the capital to be issued has been taken by the present proprietors.

The following gentlemen, who have been actively engaged in the management of the two businesses in the past, will form the Board of the new Company:—

William Cowan, *Chairman.*
William Coulson Parkinson.
William Henry Cowan.
John Leslie Cloudsley.
Joseph Hepworth.
Frederick Richard Smith.
William Cheshire.
William Wallace Parkinson.
William Wark (of Sydney).

The firms above named are two of the oldest in the meter trade; Messrs. W. Parkinson and Co. being the successors to Mr. Samuel Crosley, the original manufacturer of gas-meters.

The business will be continued under the same management, and carried on upon similar lines to the present; and it is believed that the combined experiences of the two firms will prove of advantage to their numerous customers in all parts of the world.

HIGHER LIFE FOR WORKING PEOPLE.

We have recently devoted some considerable space to the consideration of a book treating of the same subject as is indicated by the title of the work before us*—namely, how best to advance the welfare of the working classes. That book (Dr. Gilman's "Dividend to Labour") received our warm commendation mainly because it dealt in the results of practical experiments much more largely than in theories of arm-chair philosophers and the specifics of political quacks. This work, on the other hand, we must write down as of correspondingly little value, because it is a collection of proposals which bear impressed upon them the stamp of the unpractical political amateur. The resemblance between the two books, therefore, is one only of purpose, not of achievement.

It is but fair to say that the author appears to be aware of the unsatisfactory character of some of his proposed methods for securing the solution of "some pressing social problems, without injustice to Capital or Labour;" for, referring to his plan for not merely alleviating but finally remedying the trouble arising from time to time from the insufficiency of work to keep everyone employed, he says he expects that the proposal "will prove to be a stumbling-block to most readers . . . but that, in justice to the general subject, a study of this portion of it he felt bound to make, and bound to offer some mode of dealing with this, the greatest problem of all. . . . He is," he adds, "quite aware that the plan proposed will appear far-fetched, and to be (to use a colloquial phrase) 'too large an order.' It seems to him, nevertheless, that any scheme designed for the same purpose must be liable to the like criticism." But why, in the name of goodness, make a proposal simply for the sake of making one, if that proposal—or any other with similar design—be obviously impracticable? If Mr. Stephens really wanted to write a useful book (and from his preface we gather that he had some higher purpose than that of mere book-making), why introduce into it a suggestion which he was perfectly well aware did not stand a ghost of a chance of being adopted?

One would have thought that if every conceivable scheme for effecting a certain purpose were seen to be open to the vital objection of being unacceptable to the majority of people—who, be it remembered, have a say in the putting of schemes into practice—it would have occurred to the author to ask himself whether the difficulty was not one really incurable in any community working upon business principles and governed by economic considerations. The condition of affairs in which the supply of labour exceeds the demand, must exist at intervals in every industrial country where trade is subject to violent fluctuations; and no attempt to artificially prevent such a condition from ever coming about can, we firmly believe, possibly succeed. Mr. Stephens, however, thinks differently; and the following is, briefly, the precious scheme he outlines.

The country, he suggests, should be districted and a Labour Organizing Board appointed for each area. A record of all unemployed persons should be kept; and when the number seeking employment within any district exceeded on an average for six months (say) 7500—unconnected with any strike or lock-out—this Board should "be bound to take steps to organize employment as directed in the Act." This, it is suggested, they should do by "a rightly organized system of Home Colonies"—a plan selected as complying with the requirements of "not invading ground at present occupied by industrial forces," of "obtaining new ground for itself," and of being self-supporting. As the Colonies abroad have succeeded in fulfilling these requirements, and also in relieving the congestion of the labour market in this country, what, it is asked, is there to prevent Colonies at home from being "equally successful in the same directions?" Mr. Stephens is such an obviously well-meaning man, that we do not here like to say all we might. But has he really never asked himself how it is, if there be "new ground" in this country, unoccupied at present and capable of supporting tens of thousands of persons solely by means of its own as yet undeveloped resources, that his fellow-countrymen have been such lunatics as to overlook the fact, and emigrate to the Colonies abroad to seek employment and fortunes? He points to the Deer Forests of Scotland as affording wide scope for the employment of labour, and declares that "we know at least that throughout England there is area ample enough to employ the labour of many hundreds of thousands of new hands for generations to come." But he does not attempt to show that labour could be profitably employed in these places; while he admits that any scheme to be adopted must be self-supporting. Mr. Stephens showed the best judgment when he foreshadowed for his proposal the criticism of being "too large an order." It is certainly one that no Government will make, nor the country ever sanction. The solution of this social problem is, says Mr. Stephens, "merely a question of organization." In such fashion do some people rush in where statesmen fear to tread.

Sentimentality and impracticability, in fact, are writ large over all the chapters of this book. That dealing with the Poor Law and its reformation, for instance, contains the suggestion that habitual casuals "should be sent to a special Labour Colony, and made as far as possible to maintain themselves by their work." This sounds all very well; but then the habitual casual will not work—that is just what he will not do. So, unless he is made a convict, and work thereby forced out of him, how much further will the proposed reform carry us? The same chapter also contains the suggestion that the working classes should be led to overcome their dislike to the workhouse, and should be taught "that, indeed, a loss of self-respect (if any) is suffered more by accepting help from private individuals, to whom they have rendered little or no service, on whom they have no claims of any kind, than by accepting assistance from the nation, to whose social arrangements they have throughout their life contributed their part, and on whose surplus wealth, which they as workers have helped to create, they may be said to have a claim to a reasonable extent in case of absolute need. They should be reminded that, as members of the working class, they have, while they prospered, paid their share directly or indirectly of the national taxes, *and are fairly entitled to benefit in their distribution.* They should be told, in short, that the Poor Law fund is one from which they need have no more scruples in drawing, in case of necessity, than from any other fund to which they may have contributed in their better days when insuring against the future." Was ever sorrier stuff written? The sentence we have italicized appears to show that the author regards the Treasury as a sort of Slate or Goose Club with an annual sharing-out! And these are the doctrines that are to introduce "Higher Life for Working People." Well, high living and low thinking are not infrequently coupled together, and teaching more calculated to lower the self-respect of the poor we cannot conceive.

After this, we are quite prepared to find (as we do) that the author advocates the eight-hour day for everyone, is a strong upholder of Trade Unions—which make their members more intelligent workmen!—and has a scheme of his own for providing old-age pensions, which scheme (in the opinion of its author) "is free from many of the objections which the Select Committee on Old-Age Pensions felt bound to make to the schemes in general laid before them." The proposals of one who undertakes to solve, in the space of a few pages, a problem that has baffled all the leading experts in finance, deserves some notice, and the pretensions of their author to deal with questions of political economics can be thereby judged. His idea is, briefly, to provide an annuity (to commence at any time after the age of 55) equal to the amount accumulated by means of contributions of 12s. per annum from each wage-earner who may choose to join the scheme, *plus* 6s. per annum each from the employer and from the State. Mr. Stephens only estimates that 3,000,000 workpeople would subscribe. They would, of course, be the more thrifty ones, who would merely prefer to entrust their money to the State rather than to a Friendly Society; and the real problem would remain absolutely untouched. The annual cost to the State, on the basis of 3,000,000 subscribers, would be £750,000; but this, as well as the cost of administration, would, according to Mr. Stephens, fall from Heaven. For, he says, there would be a revenue from the subscribers and their employers—he assumes that all workpeople are employed, and that none work on their own account—equal to £2,250,000 per annum, while "the State's contribution of £750,000 would meanwhile [no annuities would become payable until twenty years after the commencement of the scheme] be only a book entry. Thus in twenty years the State would have in hand £45,000,000 to be applied"—to providing Old-Age Annuities? no, "to the reduction of the National Debt!" Did anyone ever read such nonsense in a book supposed to have been written for a serious purpose? Putting aside the absurd remark about "the reduction of the National Debt," what a financier must he be who talks about the State's contribution as being "only a book entry." It certainly would (like all other transactions) be a book entry; but it would, of course, involve an entry in the Budget of a corresponding amount, to be raised by taxation. Does Mr. Stephens think a gas company accumulates a reserve fund at no further cost to the shareholders than a book entry? We do not think we need more closely examine this "practical scheme."

In conclusion we may add that Mr. Stephens is in favour of profit-sharing—the one point whereon his views are, in our opinion, sound. We have, in fact, to say that Mr. Stephens has, with the best intentions, failed entirely to produce a work of any value to those who wish, within the bounds of reason and practicability, to forward the best interests of the working classes.

* "Higher Life for Working People." By W. Walker Stephens. London: Longmans, Green, and Co.; 1900.

Velocity of Light.—At the meeting of the French Academy of Sciences on the 5th inst., M. Perrotin read a paper on the above subject; a re-determination having been made by Fizeau's method. The distance between the two stations was nearly 12 kilometres; and the mean result of about 1500 observations by two persons was 299,900 kilometres per second.

Society of Arts.—The opening meeting of the new session (being the 147th since the foundation of the Society in 1754) will be held to-morrow evening, when an address will be delivered by Sir John Evans, K.C.B., F.R.S., Vice-President and Chairman of the Council. For the meetings previous to Christmas, the arrangements include a paper on the 12th prox., by Dr. Frank Clowes, Chemist and Superintending Gas Examiner to the London County Council, on "The Treatment of London Sewage."

USE OF THE HYGROMETER IN STUDIES OF VENTILATION.

An interesting turn has been given to the study of the ventilation of interiors by those observers who have in these later days drawn attention to the importance of the temperature and the degree of humidity of the atmosphere of inhabited rooms, as affecting the health and comfort of the occupants. Sir Benjamin Baker has recently declared that, so long as it is "taken cold," a very high proportion of carbonic acid can be inhaled by human beings without distress. The Board of Trade regulations as to the relative amount of humidity permissible in the air of certain kinds of factories have served to exhibit the importance of this consideration. The late Surgeon-General Pringle, who was very interested in gas cooking and heating appliances, used to make a great point of the necessity, in all circumstances, of preserving the proper and natural degree of moisture in the air of warmed rooms. The same subject is also beginning to engage attention in the United States, where recently Mr. J. H. Kinealy expounded the elements of the matter in a technical periodical published in the interest of domestic sanitation.

Following Mr. Kinealy's paper, which may be characterized as a fresh breaking of old ground in this study, we begin by considering the origins of the total moisture in the air of rooms. This quantity is the sum of three different sources of atmospheric moisture—the product of the combustion of the gas or other illuminant used for artificial lighting; the portion brought in by the inflowing air; and that which is emitted by the bodies of the occupants. The first quantity can be averaged, according to the author, at 50 grains of water per cubic foot of ordinary town gas. This estimate requires some explanation. Mr. Thomas Wills, in 1878, stated the production of aqueous vapour by burning coal gas at 372 grains per cubic foot. In Mr. H. O'Connor's "Gas Engineer's Pocket Book," the production of aqueous vapour by a coal-gas flame is put at 440 grains per cubic foot. No authority for the statement is given.

That this question of the effect of moisture in the air of inhabited rooms on the health and comfort of the occupants has not been overlooked by gas engineers, is conclusively established by the treatment of the subject at the hands of Mr. Norton H. Humphrys, in his "Chemistry of Illuminating Gas," p. 29. The author refers to the early lectures, on the chemistry of coal gas and its combustion products, of Dr. Letheby (1871) and Mr. Henry Aitken (1878). These contributions to the study of the subject are duly recorded in the "JOURNAL" for those years. It is true that Mr. Humphrys himself dismisses as unimportant the question of the formation of water by the gas used in lighting an apartment; but this opinion does not refer to the investigation of the matter as a point of scientific interest.

Mr. Kinealy, passing on from the consideration of the gas-combustion water, next discusses the proportion of water brought into interiors in the air from without. This is equal to the number of cubic feet of air, measured at the outside temperature, which enters during a given period, multiplied by the weight in grains of the moisture per cubic foot. This is a quantity that varies from day to day and hour by hour. Its determination raises at once the generally-neglected problems of the use of the hygrometer. The usual method of ascertaining the relative humidity of the atmosphere is now by readings of the wet-and-dry-bulb thermometer, the indications of which were first reduced to a system for this purpose by Mr. Glaisher. It is by no means obvious how these readings are to be interpreted in terms of the dryness of the air; because, of course, a thermometer indicates conventional degrees of temperature, and nothing more. The following conversion table is given on the authority of Mr. Glaisher in Box's "Heat." Assuming that the difference of simultaneous readings of the dry and wet bulb Fahrenheit thermometer is designated "degrees of cold," we get for ordinary atmospheric variations—

Dry Bulb.	Degrees of Cold. 1	2	3	4	5	6	7	8	9	10	11	12
	Degrees of Humidity, Saturation = 100.											
32	87	75										
42	92	85	78	72	66	60	54	49	44	40	36	33
52	93	86	80	74	69	64	59	54	50	46	42	39
62	94	88	82	77	72	67	62	58	54	50	47	44
72	94	89	84	79	74	69	65	61	57	54	51	48
82	95	90	85	80	76	72	68	64	60	57	54	51

With these constants at hand, we can proceed to give their meanings to the indications of the hygrometer. It must be borne in mind, meanwhile, that air showing upwards of 85 per cent. of the limit of its capacity for carrying moisture at the ascertained temperature feels "damp." About 65 per cent. of moisture is moderately dry; at 50 per cent. on the same scale the air is dry; at 35 per cent. it would be called "very dry;" and at 25 per cent., "extremely dry."

So supreme is the effect of temperature on the relative dryness of an atmosphere, that when the outside air is at 30°, and saturated with moisture, if it is brought into an apartment indicating a temperature of 70°, its relative humidity at once falls to 8·5 per cent. If saturated air at 30°, 40°, 50°, and 60° is similarly brought into a room heated to 70°, their relative humidity will fall to 25·5, 36·5, 51·6, and 72 per cent. (Kinealy). These figures show how completely the question of dryness and dampness is a matter of temperature—the original degree of saturation, of course, remaining unaltered.

It scarcely needs to be pointed out that while a moderate degree of dryness of the atmosphere is conducive to comfort, an excessive degree of it is both uncomfortable and dangerous to health, from the rapidity with which the natural body-moisture is evaporated thereby. This is exemplified by one's experience of a Turkish bath. The newly-stripped subject feels cool, though the thermometer marks something between 80° and 90° Fahr. He does not sensibly perspire upon entering into the hottest chamber, where water would boil; but upon returning to the cooler apartment the perspiration begins to run off him in streams. In a lesser degree, this is what happens to the occupants of all overheated assembly and living rooms. In an ordinary apartment, warmed by an open fire, overheating rarely occurs, unless the room is overcrowded, and the air overloaded with the products of superfluous gas-burners.

The actual temperature of the body itself changes very little, as the now common use of the clinical thermometer shows; so that when people complain of being either hot or cold, they mean that such are their sensations, which are referable to the external conditions rather than to the physiological fact. Hence it is desirable that the character of the external conditions shall be determined, wherever possible, by instrumental observations, and not left to be manifested by physiological experiences—always unpleasant and fraught with danger to health.

As regards moisture, an adult individual adds by his vital processes of respiration and perspiration anything from 300 to 600 grains of aqueous vapour per hour to the atmosphere in which he lives. This is for ordinary temperatures, and ordinary degrees of atmospheric humidity. Experiments quoted by Mr. Kinealy show that, in order to prevent the emission of much moisture from the body in a cool room, and thus prevent the loss of heat and the feeling of cold on the surfaces, the humidity should be slightly higher than in a warmer room where it is desirable to have more moisture emitted from the body in order that it shall feel reasonably cool. Thus, by a proper adjustment of the relative humidities, a room at 60° Fahr. may be made to feel quite as comfortable as one at 70° Fahr.; while at the latter the rate of perspiration must be kept up in order to prevent the feeling of chilliness due to too low humidity, or stuffiness due to its excess. And inasmuch as any bodily exertion increases the emission of aqueous vapour from living individuals—as much as three or fourfold, indeed—it is plain that the hotter the room the greater the difficulty of keeping the air reasonably fresh.

Many considerations spring out of these data. Having regard to the fact that the production of aqueous vapour from a coal gas flame cannot be more than about 400 grains per cubic foot of consumption per hour, while that of every adult person is perhaps 50 per cent. higher, even if he is quiescent, it appears that the moisture due to the burning of a single incandescent gas-burner in a room will not differ greatly from that from a single occupant. It follows next that the ultimate condition, as regards moisture, of the air of an unventilated, unwarmed interior will depend far more on the number of persons it contains than on the means used for artificial lighting, whatever these may be. This observation reveals the folly of those who pretend that the problem of the ventilation of crowded buildings is rendered any the easier of solution, or less important, by the adoption of electric lighting. Rather the contrary, indeed; because it is obvious that the less ventilation there is for an occupied room, the nearer the point of saturation approaches as time goes on. With nothing to take the chill off the walls and the ceiling—and the loftier the roof the worse it is in this respect—an unwholesome dew gets deposited on the surfaces, and the chilled, damp air falls down on the people. Perspiration is checked; a feeling of oppression and of nausea is experienced by the less robust; and the instant the inmates leave the hall for the corridors and the open air, the penned-up perspiration breaks out, to be followed by a dangerous chill. The instinctive turning-up of coat collars and donning of wraps by people in these circumstances has as much to do with the question of relative humidity as it has with that of temperature.

A proportionate consumption of gas for lighting a not too-crowded apartment is an automatic cure for this relative humidity evil. If the heat of the gas raises the temperature of the upper regions of the atmosphere by 5° or 10°, it means that the added moisture due to human life will be suspended in the upper air. This is a physical truth which cannot be gainsaid. Science therefore indicates that among other rules of good ventilation should be included this, that the temperature of the air in the upper part of the room should always exceed that of the breathing level by a moderate figure—not more than 10°. The work of foul-air extraction should therefore be adjusted to this requirement. In really hot weather, the whole atmosphere should be thoroughly changed as frequently as possible, on other accounts. It is in cold or damp and chilly weather that the difficulty of keeping the relative humidity right is likely to be most felt.

Lastly, comes the consideration of the effect of stove as compared with open-fire heating of rooms. This is a phase of the problem that only exists where the use of open fire-places is practicable; and in this connection it must be borne in mind that the substitution of gas "fires" and warming stoves for coal-fires has already been carried very far in the United Kingdom, and is growing every year. The free, not to say excessive and certainly unregulated, ventilation of rooms by the open chimney-

throat is abolished where this change is made; and the question naturally arises as to whether the indications of the hygrometer have any bearing upon the new conditions. The answer is that probably the air of gas-heated apartments is slightly drier than that of coal-fire heated rooms similarly conditioned, especially if occupied by only one or two persons. Consequently, a certain amount of added aqueous vapour is frequently found grateful, as correcting the "harshness" of the air of such apartments. This, of course, can be supplied in several simple ways. It would be useful to take a hygrometer test of the air of rooms so fitted, to make sure that the conditions are as might be expected. In conclusion, we can endorse the words of Mr. Kinealy on the general subject: "The matter of the humidity or amount of moisture in the air of theatres, churches, assembly halls, and school rooms is one of great importance, so far as the comfort, if not the health, of the occupants is concerned; and it merits more attention than it usually gets. In fixing upon the humidity to be maintained, it may be said that it should, for most people, be between 40 and 60 (per cent.) for a temperature of about 70°; and it should be nearer 60 than 40 for temperatures less than 70°, and nearer 40 than 60 for temperatures greater than 70°." Of course, the last observation is chiefly intended to show how the balance inclines within the ordinary range of temperatures; for nobody wishes to live long in rooms exceeding this maximum temperature. A difference of from 6° to 8° between the wet and dry bulb readings, at the customary British indoor temperature of 60° or 62°, is well within the limits of this prescription.

GAS CONSUMERS AS GAS PROPRIETORS.

The little impromptu discussion which took place at the recent meeting of the Gas Companies' Protection Association on the various methods of issuing gas stocks, has invested the subject with renewed interest. On the surface, the question does not appear to present much scope for debate; but it is one which, under the altered circumstances of the day, is worthy of consideration, and, wisely considered, may lead to profit. The existing and the past conditions of a gas undertaking are widely different; and it is the growth of competition that has made them so. While gas undertakings have, to use a common phrase, "held their own" in that competition to the present time, it would be imprudent for the administrators of those undertakings to rest content, and not to take every measure that is within reach to strengthen their position for meeting competition in the future, which is certain to be waged against them with increasing force. In the issue of new capital may be found one way of gaining strength.

The gas administrator who requires a new supply of capital has before him the choice of two methods of issuing it—by auction and by tender; and to which method he shall have recourse is to a large extent determined by the view he takes at the moment as to which (auction or tender) will produce him the best price for the stock he has to offer. He wants money; and it is to him a question of money, and nothing more. The higher the premiums he can capture by the competitive issue of the stock, the better, he argues, for the undertaking—now and hereafter. But, as a rule, he does not look deeper than that; and, while his argument is up to a certain point true, there are other questions to which he may with advantage give heed. It is in these other aspects of the matter that he will find influences which would have an immediate, and perhaps in even greater degree an ulterior, effect upon the inherent strength of the concern under his charge. Cheap money, although an important factor in the economical conduct of a gas-works, is not everything. The remarks made at the meeting of the Gas Companies' Protection Association furnish food for reflection; and reflecting, one is soon impressed with some of the feelings which must have moved Mr. Livesey when he asked Parliament to grant the two Companies with the management of which he is so intimately associated power to issue stock to "consumers" and "employees." Such undertakings as gas companies which have the sole right of supply of a specific commodity in a district are altogether different from other classes of undertakings which are not restricted to a particular locality. A gas company's business in its staple commodity is bounded; but, with few exceptions, all other commercial companies are free to traffic just where they will. While a gas company has the sole right of supply of its own chief commodity in an area, it is not free from competition from other commodities which produce for the user a like result. Therefore the strengthening of the undertaking by securing, through the auction mart or the tender form, the uttermost penny for new capital is not the only consideration; the strengthening to obtain the greatest rebutting effect in competition must be carried through the whole system—even to the consumers. The man who has the greatest number of friends is the strongest to face the world; and so a gas undertaking which has a large number of local friends, more particularly if they are pecuniarily interested, has a smoother present existence and a stronger constitution for battling with the future than an undertaking, however magnificent its works, which is dependent upon a number of people for support who have no more interest in it than exists between any ordinary shopkeeper and his customers. This is what Mr. Livesey has recognized; and he has shown the way in which a gas company may increasingly and powerfully supplement its strength. That way is by affording the consumers of all classes a direct opportunity of becoming part proprietors in the business which they support by their custom. The sliding-scale made the consumers nominal partners; a small amount of stock—and no matter how small—makes them partners in reality, and confers a vote and voice in the management of the business.

The issue of stock by auction or by tender does not secure to the full Mr. Livesey's aspirations. Auctions may be conducted locally, and tenders may be invited locally; but in both cases the door is opened to the speculative outsider with the long purse, and no interest in the concern beyond what he can make out of it, and in whom, in turn, the concern has no interest beyond that of handing over to him dividends derived from the locality so long as he happens to hold the stock. The local investor has a greater interest; and the local investing consumer has a still greater one. The offering of the stock for sale by auction or by tender has, by scattering the stock far and wide, the effect of tenuating the interest in the undertaking; but the greater the directors of a company can make the holding of stock in the district of supply, in the same ratio is the interest solidified. What, then, can have a more potent influence in promoting strength and ensuring prosperity than having as proprietors the consumers themselves? That is the direction in which both the South Metropolitan and the Crystal Palace Gas Companies have sought strength, and in which they are, step by step, obtaining it. What they have succeeded in doing, others may do. The power which was conceded to them will not, if asked for, be refused to others.

It was in this particular connection that Mr. R. Hall asked of Mr. Livesey information at the meeting of the Gas Companies' Protection Association. The form in which Mr. Hall put the matter showed that he, at any rate, is sufficiently keen-sighted to discern that, in the issuing of stock, the supreme advantages are secured to a gas undertaking by spreading that stock as much as possible within the limits of the Company's area of supply; and particularly among the consumers. The information which he obtained, and which through these columns was given to the industry at large, was valuable; but it did not go so far as it possibly would have done had the occasion been a little later. It may be recollected that it was mentioned that the South Metropolitan Gas Company were then issuing £100,000 of stock to their consumers, and the Crystal Palace Gas Company £20,000; and even at that early date after the invitations had been sent out, nearly the whole of both issues had been applied for. Had Mr. Livesey been speaking now, he would have been able to give further instructive particulars; but, as he is not, we have taken steps to obtain some noteworthy figures as to the Crystal Palace Company's issue. Before referring to them, however, we ought to say that both this and the South Metropolitan Company are obliged by their Acts to invite tenders by advertisement in certain papers. If application is made, a form is sent on which the reserve price is stated; but the reserve figure is not named in the advertisements. Then whatever stock is left after the day for receiving tenders has passed may be offered to the consumers, employees, or shareholders at the reserve price. For their last issues neither of the Companies had any tenders; and, consequently, the whole was free for offering to the consumers.

We have chosen the Crystal Palace Company for the purpose of illustrating this article, because its chief characteristics, internal and external, more nearly approach the majority of gas undertakings than would those of its great neighbour, the South Metropolitan Company. As already stated, the amount of the Crystal Palace Company's issue was £20,000. The invitations were sent out to the consumers on Oct. 15; and the time for application expired on Nov. 8, but even since then several applications have been received from consumers who "hoped they were not too late." The circulars were distributed, by hand, to both prepayment and ordinary consumers all over the district; the total number sent out being 25,000, which is about 600 short of the number of consumers. Those who were omitted were consumers whom the Company's officials were sure would not apply; and therefore it was useless wasting the circulars. In all 306 applications were received; and, as previously stated, the amount of stock asked for was £55,870. The list of applications and the required amounts is interesting, and it gives some idea of the class of consumers who took advantage of this opportunity of becoming interested in the Company with whom they have hitherto only had ordinary business relations. The number of applicants for £5 was twenty, for £10 nineteen, for £15 three, for £20 nineteen, for £25 fourteen, for £30 three, for £40 six, for £50 fifty-two, for £60 three, for £75 three, for £80 one, for £90 one, for £100 sixty-four, for £120 one, for £150 seven, for £160 one, for £200 thirty-four, for £220 one, for £250 four, for £300 seventeen, for £400 eight, for £450 one, for £500 sixteen; and the balance was divided into larger amounts. It will be noticed from these figures that the largest number of applicants was for £100, the second £50, and the third £200. Up to £50 the applicants received allotments in full, and the others were treated in such manner as the Board considered fair; but no single applicant received more than £100. In this way, Mr. Livesey realizes his aim, which is the spreading of the stock in as small amounts as possible over the largest number of consumers; and issuing it in small amounts gives no inducement to the monied speculator to apply. One of the applications on this occasion, however, was for £10,000; and this, it may be

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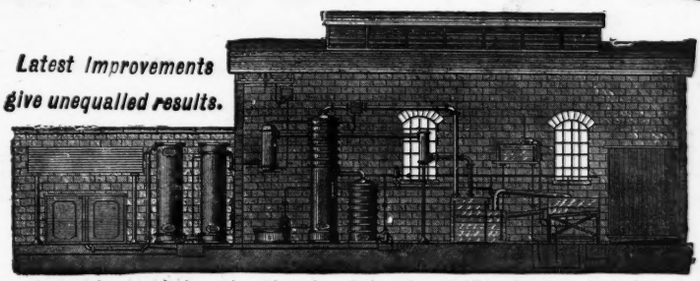

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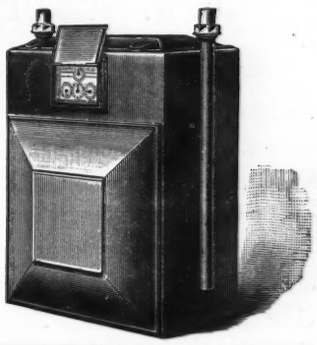

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Batley,	**Chesterfield,**	**Leigh,**	**Rotherham,**
Bow Common,	**Coventry,**	**Manchester,**	**Smethwick,**
Brentford,	**Dewsbury,**	**Middlesbrough,**	**Todmorden,**
Brighouse,	**Dudley,**	**Middleton,**	**Wakefield,**
Burnley,	**Gateshead,**	**Nelson,**	**West Hartlepool,**
Burslem	**Huddersfield,**	**Newcastle,**	**Wolverhampton.**

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supposed, was merely a speculative attempt which, as no one received more than £100, did not succeed. Among the applicants were some of the Company's own workmen who are also consumers, a few prepayment consumers, and in the ordinary class there was a preponderating number of applications from the smaller consumers, which was very gratifying. The price at which the stock was issued was £112, which at the time the issue was decided upon was a fair market price; and it is pleasing to notice that, notwithstanding the issue of this additional stock at that comparatively low price, the market value has risen. No doubt one of the secrets of the success of these issues of stock to consumers, is this fixing of the price. The ordinary investor does not understand tendering with a reserved price. What he wants to know is the exact price at which he can buy the shares or stock; and this the Crystal Palace and the South Metropolitan Gas Companies tell him. The eagerness with which the stock to which we have been referring was applied for gives ground for believing that it would all have been readily taken up even if the price had been placed at a higher figure. As it is (at the present price of gas and at the price of issue), the stock will yield £4 9s. 3d. per cent. on the investment; and in the case of the South Metropolitan Company's issue, the yield will be £4 2s. per cent.

This is the second issue of stock to the consumers in the Crystal Palace Company's district. The previous one was on Jan. 1, 1897; and it was of similar amount. Then only 208 consumers made application, as against 306 on this occasion; and the amount applied for was then £45,110, as against £55,870 on this occasion. These figures bear eloquent testimony to the faith the consumers have in the Company; and it is a full justification of the Directors' policy. An interesting fact is that nearly all the applicants for this last issue were not shareholders before; and therefore the two issues have given to the Company something like 500 shareholder consumers, which is a no mean stay in the stability of the Company's business. And, of course, these figures do not include the large number of consumers who are holders of stock purchased on the market. The 500 consumers, however, would, in all likelihood, never have become shareholders but for the action of the Directors; and the extent of the beneficent influence of this action on the future of the Company, no one can foresee.

In writing this article, we have viewed the question without having regard to the present condition of the money market or the depreciated value of gas securities on account of the high price of coal—both being exceptional. But it is an interesting fact, worth noting in this connection, that while difficulty is experienced just now in getting rid of substantial amounts of stock or shares by the ordinary means of auction or tender, the two Companies we have been alluding to have succeeded in placing these large issues among their customers, with a considerable surplus application in one case (the exact result of the other we have yet to learn). Only last Tuesday a near neighbour offered (at par) £30,000 of new ordinary stock for sale by auction at the Mart; and, although the stock yields above 5 per cent., only £17,400 of it was publicly disposed of.

Disinfecting Well Water with Permanganate of Potash.—According to some experiments made at the camp of Châlons, of which a few particulars are given in the "Revue des Produits Chimiques," 5 to 10 centigrammes of permanganate of potash per litre of water destroys by oxidation all the organic substances, and sterilizes the water by killing all living organisms. To attain this result, it is requisite to obtain a rose colour during half an hour. A brown compound of oxide of manganese is formed, perfectly inoffensive, which can be removed by mixing fine charcoal dust with the water, or a mixture of cleansed charcoal dust and sand—25 per cent. of the former to 75 per cent. of the latter. In three or four days the water is quite clear. Well water thus treated only had 1026 microbes per cubic centimetre in it, and no putrid or pathogenic organisms, though it had previously contained 72,306 microbes and a considerable number of the putrid species exhaling a disgusting odour. A well containing 112,160 bacilli per cubic centimetre before treatment only had 150 bacilli afterwards.

Manchester District Institution of Gas Engineers.—The 124th quarterly meeting of the Institution will be held next Saturday, at Southport, under the presidency of Mr. T. N. Ritson, of Kendal. We learn from the programme issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich) that on reaching Southport, shortly after eleven, an electric tramcar will convey the members to the gas-works, which will be inspected under the guidance of Mr. John Booth, the Gas Engineer to the Corporation. Special interest will doubtless be shown in the carburetted water-gas plant and the Peebles and benzol systems of carburetting which are in operation at these works. The Gas Committee of the Corporation will entertain the members at luncheon at the Victoria Hotel, after which the business will be proceeded with. This will comprise the election of new members and the President for the ensuing year, a description of the Southport Gas-Works by Mr. Booth, and a paper by Mr. R. G. Shadbolt, of Grantham, on "The Minimizing of Sunday Labour in Gas-Works." Discussion will be invited on this latter communication; and, at the close of the business, tea will be served, as usual.

OBITUARY.

John Blacket Gill.

We regret to announce the death of Mr. John Blacket Gill, the Chairman of the Commercial, European, and Oriental Gas Companies. Never, perhaps, in the enjoyment of robust health, Mr. Gill had for some time past been a great sufferer. His calm fortitude, however, and his unflinching devotion to duty effectually concealed the extent of this from all but those who knew him best. His symptoms recently having become more acute, he had gone to Eastbourne in search of relief, but without success; and he died there on the 11th inst. Mr. Gill had been prominently connected with the gas industry for more than 27 years, having been appointed in February, 1873, to a seat at the Board of the Ratcliff Gas Company, of which undertaking his father had for many years previously been Secretary. Upon the amalgamation, in 1876, of the Ratcliff with the Commercial Gas Company, he became a Director of the latter Company. In March, 1889, he was chosen Deputy-Chairman; and in March, 1890, he became Chairman. His connection with the Oriental and European Gas Companies was more recent; he having joined the Board of the former in 1887, and of the latter in 1891. A clear-headed man of business, and a most courteous gentleman, he had won the highest esteem and regard of all his colleagues over whose counsels he presided; while his kindly manner endeared him to all the staff, both English and Continental. The qualities which achieved for him success while presiding over general meetings were yet more rare. In plain, unvarnished language, free from all oratorical affectation, he would place the affairs of an undertaking before the proprietors with a transparent sincerity which irresistibly impressed his audience with the conviction of faith and with confidence in the speaker. Mr. Gill was 61 years of age at the time of his decease; and he was interred on Thursday last at Caterham, where he had resided for the past 14 years.

T. W. R. White.

The earthly remains of the late Mr. T. W. R. White, whose death was announced in the "Journal" for the 13th inst., were laid in their last resting-place in Sherborne Cemetery on Wednesday afternoon, in the presence of a large assembly, including many of the principal residents of the town and neighbourhood. Three of the Directors of the Sherborne Gas Company—Messrs. Dalwood, Pooley, and Vincent—attended, as well as Mr. Brock (Assistant-Manager), Mr. Knowles (Clerk), and a goodly number of the employees. The Urban Town Council, the local lodge of Freemasons, and other bodies, were well represented, though there was no formal attendance; and it was understood that every visitor came in an unofficial capacity. Unfortunately, the season of the year, and a somewhat brief notice of the ceremony, were not favourable to an adequate representation of the industry with which Mr. White was especially identified, and of the large circle of friends in the gas engineering profession by whom he was highly respected and esteemed. But many of those unable to be present sent wreaths and other tokens of their remembrance. Among those who attended, however, were Messrs. E. Howell (Yeovil), Norton H. Humphrys (Salisbury), J. Lowe (Weymouth), F. Osmond (Dorchester), and F. Philpots (Dursley). The coffin was of polished elm with brass mountings, and bore the inscription: "T. W. R. White. Died Nov. 12th, 1900, aged 55 years."

Mr. White came to Sherborne from Dursley about the year 1866, and had held the appointment of Manager and Secretary to the Sherborne Gas Company for 33 years. During that period he became very intimately associated with the public life of the place. He was upon the Sherborne Urban District Council, and was the oldest member of the Technical School Committee, and Chairman of the Gardening and Finance Committees. He was also Vice-Chairman of the Longburton Technical Instruction Committee, a member of the Burial Board, a Governor of Foster's Grammar School, and of the British School. He was initiated a member of the Sherborne Masonic Lodge of "Benevolence" in 1877, and had been a Past Master of the lodge for 15 years. His connection with the South-West of England District Association of Gas Engineers and the Gas Institute was referred to last week. He was highly respected by his fellow-townsmen as a capable business man. He was orderly and punctilious to a degree; and the Sherborne Gas-Works have long been quoted as a standing example that a gas-works need not necessarily be either devoid of all beauty or encrusted with dust and dirt. They are a model, not only of neatness, but also of elegance. Mr. White was Consulting Engineer, and in this capacity constructed or rearranged several other gas-works in the neighbourhood. He also attained some success as a trainer of pupils for the gas engineering profession; and the excellent understanding and good feeling which prevailed between him and them, even long after they had left him, was in itself a striking evidence of his genial and kindly disposition. It may well be said of him that his light went out while it was yet day, for he might have looked for another ten or fifteen years of useful and active work. But, after a prolonged illness, he passed away while still surrounded by evidences of his handiwork. The large attendance and sincere manifestations of sorrow that were so marked a feature of the proceedings, showed plainly that a remembrance

of Mr. White will remain green in the hearts of his friends and neighbours for many years to come.

Mr. White leaves a widow, a daughter, and two sons. The elder son—Mr. Thornton White, formerly Manager of the Woodstock Gas-Works, Cape Town—is still abroad. A fitting reference was made to the deceased at the meeting of the Southern District Association of Gas Engineers and Managers last Thursday, when, as will be seen by our report, a vote of condolence with the widow and family was unanimously passed.

The death recently occurred of Mr. ELI BRYAN, who for eighteen years held the position of Manager of the Beverley Gas-Works, and at the time of his death held a similar post in connection with the Raunds Gas Company.

The death occurred last Thursday, at the early age of 46, of Mr. JAMES HUSBAND CARVOSSO, Engineer and Manager of the Dartford Gas Company. Deceased was a member of the Southern District Association, which he joined at the November meeting in 1891.

The death recently occurred of Mr. ARTHUR H. LOCK, the Chairman of the Dorchester Gas Company, as the result of an apoplectic seizure. Deceased was a Solicitor by profession, and had had an honourable career in municipal life—on two occasions filling the position of Mayor; and his loss will be keenly felt. He was elected an Alderman in 1898.

PERSONAL.

At the end of the year, Mr. F. G. COCKEY, Assoc.M.Inst.C.E., will be leaving Newport (Isle of Wight) to take up the management of the new Swindon Gas-Works.

Mr. J. HARGER PYE, Engineer and Manager of the Clevedon Gas-Works, has, in virtue of a mutual arrangement come to between his Directors and those of the local Water Company, been entrusted with the management of the water-works, with a commensurate increase of salary.

Mr. JOHN DENNEY has relinquished the position of Secretary to the Ilford Gas Company, which he had held for upwards of 21 years, and accepted the seat on the Board rendered vacant by the death of Mr. Alfred Green. Mr. HENRY WILLIAM ASHMOLE has been appointed to succeed Mr. Denney.

At the Swansea Gas-Works, last Friday, the officers of the Company presented their respected Manager, Mr. THORNTON ANDREWS, with a full-sized portrait of himself, in token of the excellent feeling existing, the high esteem and admiration in which they regard him, and the kindness and consideration he has always shown for their welfare and comfort. Mr. Andrews was deeply moved by the good feeling displayed by the officers, and their expression of sincere regard for him, which he felt had increased with the number of years he had himself devoted to the Company. It was now, he said, 45 years since he first entered their service, and the works had extended in an enormous degree during that period. Many of the officers who that day attended, and had presented the excellent portrait which they had so kindly provided for him, had been with the Company for 20 years; and he was pleased to find that they all bore testimony to the good feeling which existed between them. This he had striven to cultivate; and he trusted that, notwithstanding the difficulties which all business men had to encounter at times, he had not been unsuccessful. The portrait was executed by Mr. H. A. Chapman, of Swansea, and was an admirable likeness of Mr. Andrews.

An interesting ceremony was performed at the ordinary meeting of the Board of the Newcastle and Gateshead Gas Company last Wednesday, in the unveiling of a portrait of Mr. LAWRENCE WILLIAM ADAMSON, LL.D., the late Chairman. It forms one of a series of portraits of the Chairmen since the year 1864; the others being the late Mr. John Clayton, the late Mr. Alderman Hedley, and Mr. W. B. Wilkinson. These four gentlemen link the past with the present to a remarkable degree; Mr. Clayton having been elected to the directorate as long ago as 1831. Dr. Adamson was, by invitation, present at the ceremony. Sir W. H. Stephenson, the present Chairman, in unveiling the portrait, said that the Directors deeply regretted that the multiplicity of other duties had compelled Dr. Adamson to withdraw from the Board. The loss of his long and valued experience would be greatly felt by his colleagues. He trusted, however, that the counterfeit presentment of the worthy Doctor would, for all time, adorn the walls of the Company's Board-room, and be before the members for the time being to act as a stimulus to them to do their best for the welfare of the Company. On behalf of the present members, he wished Dr. Adamson many years of happiness. Dr. Adamson returned thanks for the compliment paid to him, and for the kind expressions of the Chairman. He said the period during which he had served upon the Board had been extremely pleasant to him; and whenever he could be of service to the Company, his assistance would be gladly rendered.

The increase in the price of petroleum and the reduced cost of calcium carbide are gradually enabling acetylene gas to supplant oil as an illuminant in Germany. The importance of this may be gauged from the fact that Germany for many years has paid annually about £5,000,000 to America for petroleum, which sum has latterly risen considerably owing to advances in price.

COMMUNICATED ARTICLE.

ON THE ESTIMATION OF SULPHURETTED HYDROGEN IN COAL GAS.

By H. LEICESTER GREVILLE, F.I.C., F.C.S., &c.,
Chemist to the Commercial Gas Company.

International literature is always the most interesting, because it is always the most comprehensive. Science is so far impartial that it is cosmopolitan. Many students have, however, a limited knowledge of languages outside their own mother tongue, and welcome translations in the "JOURNAL" of the results of researches pursued in other countries, and offered to them for perusal in what we insular people call "Good Queen's English." I always read these productions with the greatest interest, but have noticed on more than one occasion the undue elaboration involved in Continental methods, more especially those manufactured in Germany, and particularly from the representative Press organ having the euphonious title of the "Journal für Gasbeleuchtung."

The latest translation from this periodical in your columns (Nov. 6) is headed "The Estimation of Sulphuretted Hydrogen in Gas;" and I was especially impressed by the (to my mind) needless complication of the method advocated. I published some years back (see "JOURNAL" for June 23, 1896) a process for the estimation of sulphuretted hydrogen in gas liquor. The same method is applicable for the estimation of the sulphuretted hydrogen in coal gas. The procedure now advocated by Herr A. Müller may claim to possess the highest degree of scientific accuracy; and I do not propose to criticize it on this ground; but there is one substantial fact in technical science that must never be lost sight of—viz., that methods of analysis, to be within the region of practical politics, must be capable of rapid execution, and that more useful work can often be accomplished by a quick method, accompanied by a small sacrifice of accuracy, than by a more elaborate process involving a very much larger expenditure of time and labour in order to ensure a more ideally scientific result.

My process for the estimation of sulphuretted hydrogen in gas liquor is based upon the use of a standard solution of ammoniacal copper sulphate, reacting on sulphuretted hydrogen with formation of copper sulphide. The full details of working can be ascertained by reference to my article; but considering the time that has elapsed between the previous and the present communications, it will perhaps be useful to republish the figures embodying the results of my volumetric test, in comparison with the more usual and tedious gravimetric method of precipitating the sulphuretted hydrogen as arsenic trisulphide (As_2S_3).

Comparative Tests of Sulphuretted Hydrogen in Gas Liquors.

[Per Cent of H_2S.]

	Volumetric, by Cu Solution.		Gravimetric, as As_2S_3.
Condenser liquor	1·180	..	1·200
Scrubber	0·470	..	0·450
do. check test	0·475	..	0·450
Scrubber	0·680	..	0·690
Condenser	0·410	..	0·390
Unnamed	0·107	..	0·106
Well liquor	0·607	..	0·600
Weak scrubber liquor	0·081	..	0·079

A test can be made easily in less than five minutes.

For the estimation of sulphuretted hydrogen in coal gas, the gas is passed into the Harcourt tubes such as are used for the ordinary volumetric determinations of carbonic acid and sulphuretted hydrogen, with the usual colour standards. The first tube is charged with a solution prepared by mixing 1 volume of strong liquid ammonia with 10 volumes of water; and the second is filled with pure distilled water. In the outlet of the second tube is placed a small piece of lead test-paper, as a check on the total absorption of sulphuretted hydrogen by the solutions. The gas can be passed at a comparatively rapid rate through the capillary tubes usually employed; and for the measurement of the volume, either my "combined measure and aspirator" (as devised for the Harcourt test, and manufactured by Messrs. Townson and Mercer) may be employed, or the usual experimental meter may be used. After the conclusion of the experiment, the contents of the two tubes are emptied into a white porcelain basin and titrated, exactly as in the case of gas liquor.

As an example of the rapidity of the process, one-tenth of a cubic foot of gas was passed in between ten and fifteen minutes on a gas known to contain about 400 grs. of sulphuretted hydrogen per 100 cubic feet, without the faintest discoloration of the lead paper at the outlet—showing that the absorption of the sulphuretted hydrogen had been complete. The subsequent titration occupied less than five minutes. The calculation is of the simplest possible description. My solution is of such strength that each cubic centimetre equals 0·05 grain of sulphuretted hydrogen. Consequently, operating on one-tenth of a foot of gas the number of cubic centimetres of solution used, multiplied by 0·05, gives the proportion of sulphuretted hydrogen in grains per 100 cubic feet, counting the result in whole numbers thus—

Cubic centimetres used 9·0 × 0·05 = 450 grs. per 100 cubic feet.

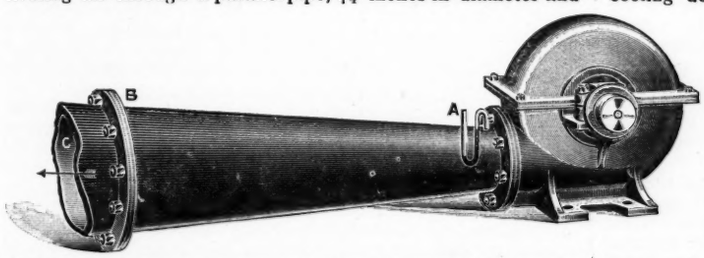
NOTES.

The Russian Petroleum Pipe-Line.

Writing recently of the prospects of Russian petroleum, we stated that it would be necessary to wait for the completion of the pipe-line from Baku to the tideway at Batoum before Russian oil could be expected to take its definitive place in the market. Particulars of this enterprise, so far as it has been completed, have recently been published in "Cassier's Magazine." It is stated that the pipe still lacks a distance of 418 miles to finish it, over which the oil is sent by rail. The pipe is laid alongside the railway, and is worked as a branch of the line. It is being laid by the Russian Government, at great expense; but in the best possible manner. The bore is 8 inches, and the material of which the pipe is made is steel, with screwed joints. The delivery capacity of the 141 miles of pipe opened last summer is 48,000 gallons per hour. There are three main pumping-stations on this section, working against a maximum pressure of 645 lbs. per square inch. The steam is supplied by Lancashire boilers, burning petroleum refuse. One of the difficulties of the undertaking was to get water for all these stations. The pipe was put together on the surface of the ground, tarred on the outside, and buried to a depth of 18 inches, to protect it from external damage and the heat of the sun. The curves of the railway track were followed; lengths of the pipe being warmed in a wood fire on the spot, and swept to the proper shape. The summit level of the line is at an elevation of 2200 feet. So far as it has gone, the pipe has materially lightened the work of the railway.

Tapering Discharge-Pipes for Fans.

Mr. W. A. Granger recently demonstrated, at the Dalston Lane Engineering Works of Messrs. Capel and Co., the efficacy of a diverging conical outlet-pipe in increasing the delivery of air by a power fan. The experiment was interesting, as Mr. Granger arranged it. A No. 2 Sturtevant fan was driven by a belt from the fly-wheel of one of Messrs. Capel's excellently-made gas-engines, which kept up a very regular air pressure, on the outlet, of 2 inches of water. This was when the fan was delivering air through a parallel pipe, $4\frac{3}{4}$ inches in diameter and



2 ft. 11 in. long, into a wooden box with a hole in it for the escape of the air. When the parallel pipe was changed for a tapering one, $4\frac{3}{4}$ inches at the outlet A, of the fan, to $7\frac{3}{4}$ inches at its far end B—the same length as before—the air pressure in the box at once rose to $3\frac{1}{4}$ inches. This is a remarkable example of the well-known property of increasing taper pipes for accelerating the discharge of fluids. Curiously enough, although the principle is so familiar as a phenomenon of physics, it is very little used by mechanical engineers in connection with such possible applications as are offered by air blowing, gas exhausting, and the discharge of fluids from orifices. Mr. Granger holds that there is a large field open for the use of this principle in connection with forced-draught machinery.

Combustible Gases in the Atmosphere.

That the composition of atmospheric air is not so simple as it is usually assumed to be for practical purposes, has long been known by chemists. Not to speak of the discoveries of various inert gases in the atmosphere by Lord Rayleigh, Professor Ramsay, and others, the presence in air of combustible gases has been suspected from the Seventeenth Century. So long ago as 1833, Boussingault proved that hydrogen is present in the air of towns and of marshy districts, most likely combined with carbon as methane. The difficulty of detecting hydrogen or methane in the atmosphere is very great, as Gautier has recently testified. We have no absorbent for either hydrogen or methane, which could be used for analytical purposes. Yet this French experimenter has contrived, by refining the combustion method, to arrive at fairly consistent and comparable determinations of the combustible gases in air at different places. Experimenting in this way in Paris, in an oak forest 40 miles from Paris, and high up in the Pyrenees, Gautier found that the amount of free hydrogen varied between 19 and 17 cubic centimetres per 100 litres. From complete experiments, it is concluded (as already mentioned in the "JOURNAL") that the air of Paris contains, in 100 litres: Free hydrogen, 19·4 c.c.; methane, 12 c.c.; higher hydrocarbons, 1·7 c.c.; and carbon monoxide, 0·2 c.c. Free hydrogen would thus be normally present in the air, and the presence of hydrocarbons is probably connected with vegetation and putrefaction. Various sources are suggested for the free hydrogen. It may be derived from the action of water on granite in the streets.

A Centrifugal Gas-Washer.

An illustrated description is given in the "Iron and Coal Trades Review" of Theisen's centrifugal gas-washer, as erected at the Hoerde Works. This is called a medium-sized apparatus, and consists of a horizontal cylinder 60 inches in diameter and 15 ft. 4 in. long. The machine sucks in blast-furnace gas from the main at a pressure of from 1 to $1\frac{1}{2}$ inches, and delivers it purified, at a pressure of 6 inches, into a holder from which the gas-engines are fed. The water is admitted by a $1\frac{1}{4}$-inch pipe, and is used at the rate of 22 gallons for every 35 cubic feet of gas, which seems a large consumption. The water, after being cooled, is used over again. Its office is to deprive the gas of dust and aqueous particles. The former is the greater nuisance. It proceeds from the crepitating materials of the charge in the upper portion of the blast-furnace, and also from the zone of reduction. The former is comparatively heavy, and deposits itself very easily in the gas-mains. The latter, on the contrary, is very light and extremely buoyant, and is carried by the gas a great distance. It consists chiefly of the oxides of the metals constituting the charge, of silicic acid, and of salts of the alkalies and alkaline earths; and there are also present products of lower degrees of oxidation of the elements, and combinations of iron with carbonic oxide. For all useful purposes, the presence of dust in the gas is objectionable. In the centrifugal washer the gas is forced against a skin of water maintained upon the inner side of the cylinder. An apparatus of the size mentioned will deal with 7000 cubic feet of blast-furnace gas per minute. It ought to be useful with other kinds of gas.

Cooling Hot Gases in Pipes.

One of the incidental studies in the engineering of automobiles is the cooling of the motor cylinders. The expedients found necessary in this regard throw some light upon the general problem of the cooling of hot gases in metal containers. All light road motors, almost without exception, follow the Otto gas-engine cycle; the rate of working being generally very rapid. For the sake of simplicity, the piston-rod is usually suppressed; the connecting rod being jointed direct to the piston itself. M. Desjacques, reporting on these motors for "Engineering," remarks that if one of them, using "petrol," starts without any cooling device, it very soon gets red hot, and stops through charring of the lubricating material. Such an internally-heated cylinder can be cooled artificially in various ways. It is sometimes cast with wide projecting wings, or has a circulating water-jacket. He prefers the arrangement of circulating the cooling water through tubes made with wings, or flanges, to increase the radiating surface. It is known that, when a metallic surface separates two mediums at different temperatures, the quantity of heat which passes increases with the difference of the temperatures. This heat is dispersed by radiation and air conduction—how divided, is not easy to say. What is more, arrangements that are good for radiation are bad for air conduction. Thus a multiplicity of flanges or deep ribs helps radiation, but hinders free air circulation. An arrangement for sprinkling radiating pipes with a water-spray is well spoken of; the point being to use as little water as possible, in order that it shall be evaporated and thus take up the great quantity of heat that becomes latent in steam. Altogether, it would seem that the study of pipe radiators is yet in an elementary stage.

The Banki Gas-Motor.

Professor Donál Bánki, of Buda Pesth, has invented a gas-engine working on a new principle. This motor has recently been described in several Austrian technical journals. It is explained that, in order to obtain high economy in an internal combustion motor, a high compression of the charge must be adopted. In the ordinary gas or oil engine, the limit of compression is reached when the temperature resulting from the operation attains the ignition temperature of the mixed charge. If this ignition temperature is reached before the end of the compression stroke, there will be a premature explosion, the motion will be reversed, and the cycle upset. In the Diesel motor, which uses high compression, and depends upon the temperature thus produced for igniting the charge, the difficulty is avoided by compressing the air only. Professor Bánki's method is different again. The charge of mixed air and hydrocarbon is drawn into the cylinder as usual; but with it is also mingled a fine spray of water. When the high compression is given to this mixture, the water absorbs a portion of the heat, and thus helps to keep the temperature of the charge below the ignition point. When ignition does occur, the conversion of the water into steam adds to the expansive power of the charge, and thus helps the power stroke; while at the same time the absorption of heat due to this process tends to keep the cylinder walls from getting over-heated. Such motors have been made, and it has been found possible to get the compression as high as 233 lbs. per square inch, without premature ignition; while the pressure attained by the explosion is 540 lbs. per square inch. The fuel used was benzine. The thermal efficiency of the motor at full load is 28 per cent. The effect of the water-jet is shown in the reduction of the loss of heat by the circulating cooling water from 40 per cent., as in the case of ordinary gas-engines, to 27 per cent.

TECHNICAL RECORD.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The final Meeting for the year of the members of the above Association was held last Thursday, at the Holborn Restaurant. There was a good attendance, and an excellent programme. It was a matter of regret that the President (Mr. D. Irving, of Bristol) was unable to be present, owing, as the Hon. Secretary (Mr. J. W. Helps, of Croydon) stated, to the illness of the Chief Engineer of the Bristol Gas Company, Mr. W. Fiddes. Early in the proceedings, a telegram was received from the President, in which he said: "Kindly apologize to Committee and members for my absence, assuring them there is no lack of interest in the Association or appreciation of honour conferred. Wishing successful meeting." Under the circumstances, Mr. A. E. Broadberry, of Tottenham, the ex-President, was called upon to take the chair.

The Hon. Secretary opened the business by reading the minutes of the last meeting, and they were confirmed. The members then proceeded to elect the

Office-Bearers for 1901.

The Chairman remarked that the first office to be filled was that of President. The rules of the Association having been altered so as to enable the members to elect a Vice-President, he had no doubt all would expect to hear him nominate Mr. Corbet Woodall, who was now the Vice-President, for the position of President in the coming year. Mr. Woodall, he was happy to say, had consented to take the office; and he (the Chairman) was certain the Association would derive a great deal of benefit from having him presiding over them.

The Hon. Secretary asked that he might be allowed to second the proposal.

The resolution was carried by acclamation.

Mr. W. D. Child (Romford) next proposed that Mr. W. E. Price, of Hampton Wick, be elected to the Vice-Presidency. Mr. Price, he remarked, had been a useful member of the Association, and had assisted it by papers, by serving on the Committee, and in other ways. He ought really to have been President long ago; but, in his good nature, he had kindly stood on one side for other members.

Mr. J. T. Jolliffe (Ipswich) seconded the motion, which was very cordially agreed to—the Chairman remarking that he was sure all the members were pleased to know that Mr. Price had at last consented to take the Vice-Presidency and ultimately the Presidency.

Mr. S. Y. Shoubridge (Lower Sydenham) moved the re-appointment of Mr. Helps as Hon. Secretary and Treasurer. The members, he said, one and all knew of the immense interest Mr. Helps took in the Association; and, without his arduous labours, he was sure the Association would not be in its present successful position. They were very grateful to Mr. Helps; and they hoped he would long continue to hold the office.

Mr. S. W. Durkin (Southampton) seconded the motion, which was heartily passed.

On the motion of Mr. F. Smallbone (Woodford), seconded by Mr. F. W. Cross (Lea Bridge), Messrs. F. G. Cockey and C. F. Ruggles were elected members of the Committee.

Mr. D. H. Helps (Redhill) proposed, and Mr. W. B. Randall (Waltham Cross) seconded, the re-election of Messrs. James L. Chapman and A. Dougall as Auditors—the proposition being cordially agreed to.

New Members.

The following names were then submitted for membership: Mr. Octavius Thomas, of Rhondda; Mr. T. R. Murray, of Tottenham; Mr. Harold W. Woodall, of Bournemouth; Mr. S. J. Symonds, of Farnham; Mr. H. S. Baker, of Reading; and Mr. George R. Love, of Guildford.

Mr. C. E. Botley moved that the gentlemen named be elected members; and he observed that all must be glad to see such an accession to their strength.

Mr. T. Price (Walton-on-Thames) seconded the motion, which was unanimously carried.

The Late Mr. T. W. R. White.

The Hon. Secretary said it was with very considerable regret that he received a letter on Tuesday informing him of the death of Mr. T. W. R. White, of Sherborne, who had been a member of the Association since the amalgamation with the South-West Association. He had also received a letter from Mr. Norton H. Humphrys relating to the same sad event. (Both communications were read.)

Mr. Durkin said it was with very deep regret that he rose to propose a vote of condolence with Mrs. White and the family. He was connected with Mr. White for a good many years in the old South-West Association; and, since the amalgamation, their late friend had been a member of the Southern Association.

Mr. H. Sainsbury (Trowbridge), in seconding, said he had known Mr. White ever since the South-West Association was formed; and he knew, as the first Secretary of the Association, Mr. White took a great interest in it and in gas matters generally, and he was always ready to communicate any information within his power to his brethren. They sincerely felt his loss to the Association and to the gas profession generally.

The members signified their approval of the resolution by rising silently in their places.

The Day of Meeting.

The Hon. Secretary read a letter received from Mr. J. D. Ashworth, of Portsmouth, who was unable to be present, owing to Thursday being his Board-day. Mr. Ashworth suggested that the day of the Association meetings should be varied a little, so that all the members might have an opportunity of attending the meetings. Mr. Helps pointed out that the letter had been before the Committee; and they desired to have the opinion of the members on the subject. Thursday was the day fixed at the commencement of the Association; and it had been adhered to since. It was true, according to the rules, that the Committee had power to alter the date, and so probably they could alter the day. They had a good many members present that day, so that evidently Thursday was not generally inconvenient. But if any of the members knew that the day was unsuitable for other members, the Committee would like to know of it.

Mr. Durkin remarked that he thought Thursday was as generally convenient as any other day; and some of the others might be more inconvenient. He thought it was a matter that should be left to the Committee to decide.

None of the other members expressed any opinion; and the matter dropped, with the understanding that any communication on the subject addressed to the Hon. Secretary would be referred to the Committee.

Mr. G. P. Lewis (Lower Sydenham) read the first paper. It was entitled—

Notes on Purifier Construction.

The mode of construction of dry purifier-boxes has, until a comparatively recent period, generally followed the lines adopted in the very early days of gas manufacture. The only improvement calling for special mention is the substitution of india-rubber joints for the cumbrous water-seals in vogue for so many years. The use of the former system of jointing, though originally proposed many years ago, remained practically in abeyance until it was employed on a considerable scale by Mr. Green, of Preston; since when it has been freely adopted by a number of engineers. This system of jointing has been proved to be thoroughly successful in practice when properly designed, and results in a considerable reduction in the weight of the boxes and covers—amounting, in some cases, to about 20 per cent.

One of the disadvantages of the water-seal system lies in the wastage of the lute-plates and side sheets of the cover at the water-line; the effects of this evil being so great as to render the use of cast iron for the lute-plates almost a necessity, while, on the contrary, wrought iron or steel is equally suitable for the construction of purifier-boxes on the dry-jointed system. Among other points, the problem of designing cast-iron side plates with water-lutes calls for some attention, as although at first sight this may appear to be a very simple operation, it is really a matter that requires some degree of experience; these plates being subjected to severe strains, due to the combined action of the outward pressure of the gas and the upward pull of the cover, also due to the same force. The general nature of these stresses is illustrated in fig. 5; the greatest strain being in the neighbourhood of the point marked A. If care is not taken to meet this strain by substantially bracketing the underside of the lute to the body of the lute-plate, and also to provide proper internal ties, considerable trouble is experienced by frequent "cracking," and, as a consequence, leakage of water from the lute. On the contrary, the strains on the side plates are much less in the case of the "dry" joint—the "lift" of the covers acting almost as a direct tensile stress; while the multiple system of covers usually associated with this method of construction, gives substantial cross-ties for resisting the outward pressure of the gas.

The fact that the side plates of dry-jointed purifiers are very much less severely strained than those with water-seals, coupled with greatly reduced weight and a wider choice of materials, has led the author to investigate the possibility of improvements in the general construction of dry purifiers; and he ventures to lay before the members of the Association a few suggestions with the aforementioned object. It should be understood, however, that these suggestions more particularly refer to the construction of purifiers and purifier-houses on the overhead system. The general lines of the proposed improvements will be most readily apparent by reference to the diagrams accompanying this communication, from which it will be seen that the main feature of novelty in the proposal lies in the idea of making the boxes not only support themselves, but also contribute to that of the upper revivifying floor and roof over same, coupled with a reduction in the weight of the pipe connections.

By reference to figs. 1, 2, and 3, it will be observed that the purifiers are oblong in shape, and are arranged in consecutive pairs, side by side, with the greater dimension in the longitudinal direction, and the contiguous sides and ends connected together in such a way as to form "box-girders;" while the outer sides and ends are ordinary web-plate girders. The bottoms of the purifiers are composed of wrought-iron or steel plates, slightly dished for the purpose of drainage, and for reducing strains due to gas pressure. It is also proposed to stiffen up the sieve-bearing

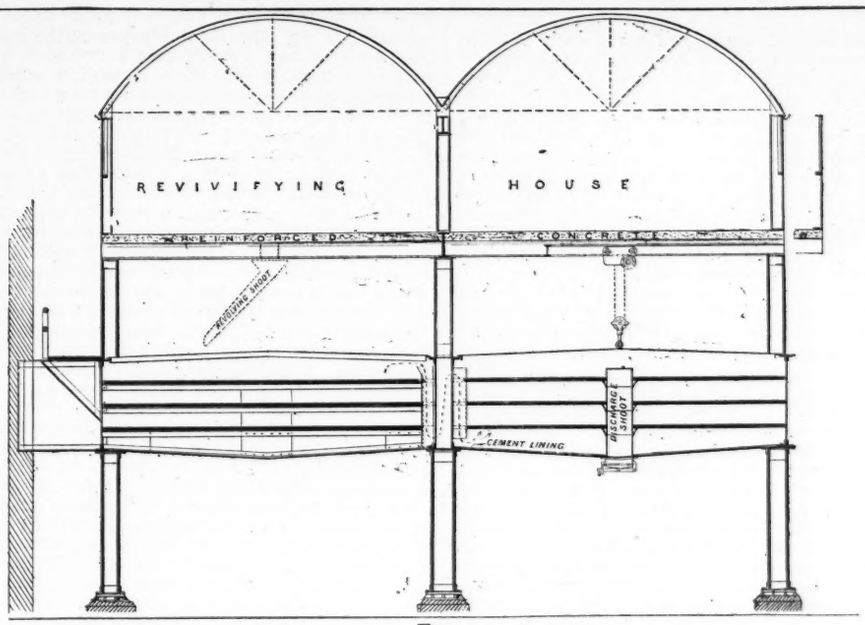


FIG. 1.

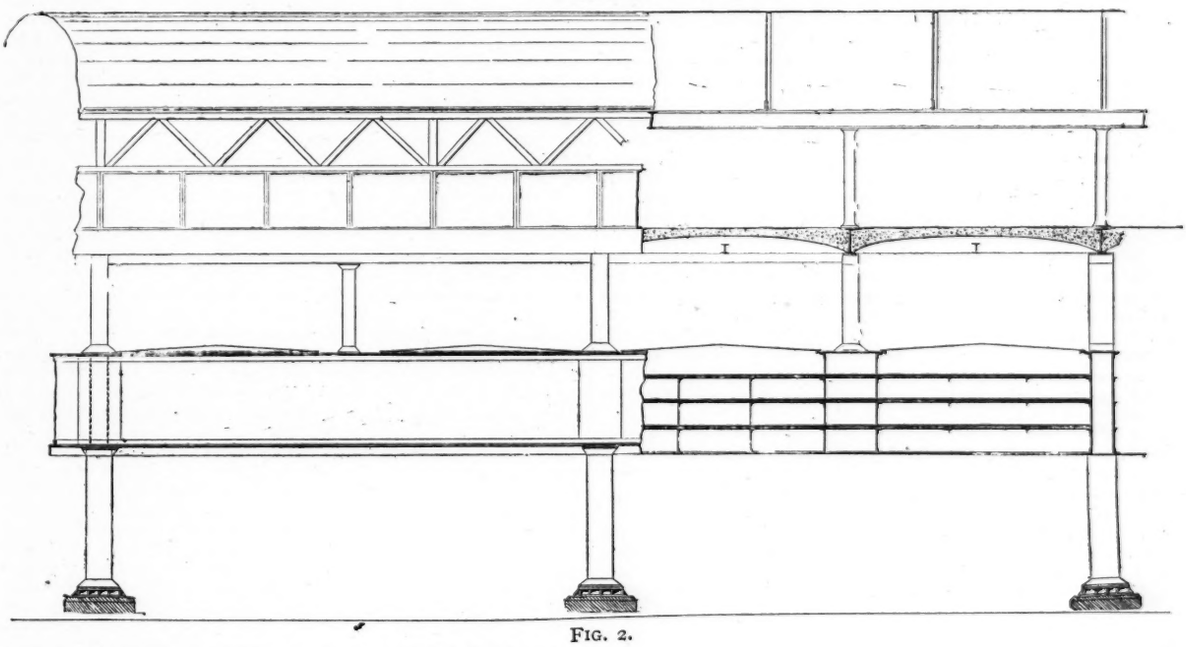


FIG. 2.

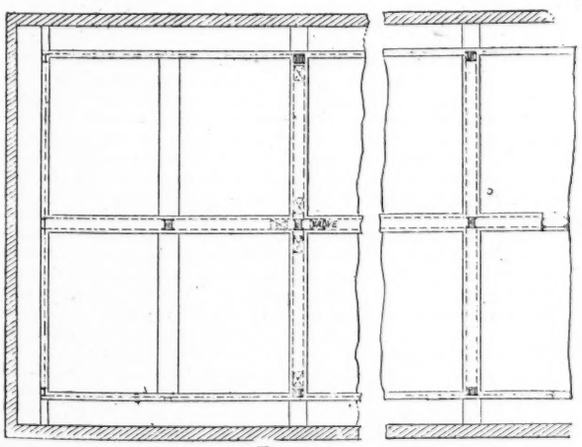


FIG. 3.

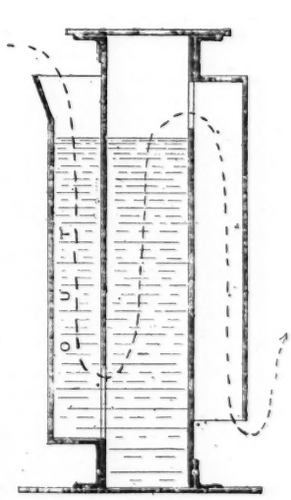


FIG. 4.

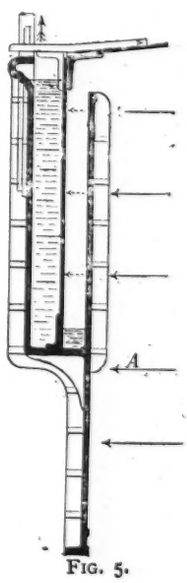


FIG. 5.

bars in combination with the general structure of the purifier, so that they collectively act as girders and struts for carrying the weight of material, and to prevent distortion of the girder sides. The purifiers are shown to be supported by short columns placed directly under the boxes; but they could be equally well carried on the outer sides, by prolonging the girders on to the walls of a building—the central columns only being retained.

The spent purifying material can be readily discharged through

the sectional discharge-outlet shown on fig. 1. Each of these sections should be made light, so that it can be easily handled by two men, and provided with a padlocked discharging door. It is also possible, with the system shown, to materially reduce the weight of pipe connections; and as these represent in ordinary practice from 9 to 30 per cent. of the weight of the purifiers and covers, it is evident that there is room for economy. By the aid of hydraulic valves formed in the body of the box-girders, as shown in fig. 4, and also by utilizing the space in the interior of the box-girders as gas-passages, it is quite practicable—assuming proper workmanship in erection—to work a set of four purifiers on a rotation system, with a less extent of pipe connections than is necessary with an eight-way centre-valve.

The use of some system of reinforced concrete flooring, such as the Monier system, or the "expanded" metal form of construction for the revivifying floor, is recommended. Full particulars of the latter system are given in a paper by Mr. A. Baker, read before the Institution of Gas Engineers in May, 1900; and although it has only recently been introduced, it has been employed already at Beckton and other gas-works for a similar purpose. The revivifying floor is shown to be enclosed by cast-iron parapet plates, with a light single lattice girder secured to the upper flanges, for the purpose of carrying the roof principals. It is self-evident that the weight of metal in overhead purifiers constructed as described must be very much less than in any water-lute system. It must be borne in mind, however, that cast-iron plates cost only about one-half that of wrought-iron or steel work, such as is shown. The degree of ultimate economy likely to be attained depends entirely on the skill of the individual designer; but the author is of opinion that the purifier-boxes and covers *alone* can be erected for about the same cost as those of equal capacity on the ordinary water-lute system, and that the cost of the supporting structure and connections can be reduced by an average of 50 per cent.

The author regrets his inability to give a greater amount of detail in the diagrams owing to the time for the preparation of this communication being somewhat limited.

The most complete and exhaustive system of sulphur purification practised almost exclusively to meet the regulations prevailing in London, remains in very much the same condition as when it was evolved many years ago. The author ventures to assert that very few of those who are, or have been, engaged in the practical working of the system will claim that it is an entire and economical success, and more especially under present conditions, when the gas manufacturer has perforce to be content with the supply of "all sorts and conditions" of a mixture called coal, giving a low yield of gas and residuals, but a very high one of other things, not the least of which are sulphur compounds and sulphuretted hydrogen. The introduction of air in purification has been of undoubted value in those happy places where sulphur clauses are unknown; but it is an unfortunate fact that it cannot be employed to the same extent under more rigorous conditions.

The hopes of the possibility of purification of gas in closed vessels, raised by the advent of the Claus process, still remain unfulfilled; and the "process" itself has apparently been relegated to the position of a thing of the past. The principle underlying the process, however—that is, "self-purification"—still remains, and is worthy of attention. A study of the very able and candid account of the failure of the experiments on the Claus process at Belfast, given in a paper read by Mr. Stelfox before the Incorporated Gas Institute in 1897, gives a good clue to the defects in the mode of application of the underlying principle. The non-success of the experiments appears to have been quite as much due to mechanical and constructional defects as to chemical ones. There is no reason why the former could not be overcome at the present day; thus restricting the problem to one requiring chemical solution only. The latter is again reduced by the proved fact that the process was found to be quite capable of effecting complete purification for consecutive periods of two and three weeks.

The reason why the system was subject to fits of bad behaviour has still to be solved, and deserves our attention. A perusal of the papers dealing with certain phases of this subject by Mr. George Livesey and Mr. F. D. Marshall, read before the Gas Institute in 1875 and 1878 respectively, sheds some light upon the phenomena. The author is of opinion that if some scheme of experiments could be initiated under the direction of a Committee of practical men, a solution would be discovered.

Hills's liquor purification process in use at the Old Kent Road Gas-Works for many years, and the more recently adopted Holgate's liquor purification system at Halifax, have proved successful within the limits of their application. Need we, therefore, despair of the devising of some intermediate scheme between the extreme pretensions of the Claus process, and the more modest aspirations of the two latter?

It may not be out of place, in conclusion, to express regret that very little progress can be claimed for improvements in the general process of purification.

Discussion.

Mr. S. Y. Shoubridge (Lower Sydenham) said he was sure the Association were much indebted to Mr. Lewis for his interesting and suggestive paper, and all the more so because it was prepared at the eleventh hour, in response to an appeal from the Hon. Secretary. The chief feature of Mr. Lewis's design appeared to him (Mr. Shoubridge) to be the combination of the purifiers with the purifier-house; and though it seemed to him somewhat doubtful as to the wisdom of making purifier-boxes of steel or wrought iron—owing to the greater liability of corrosion—there was certainly very great advantage in being able to save such a large amount in the cost of construction, as Mr. Lewis found that he could do by this method. Fifty per cent. in the cost of construction was a considerable saving. But he (the speaker) thought it was very important that the purifier itself should be kept quite distinct from the superstructure, because there was no doubt the purifier itself would wear out considerably before the other part of the structure; and in that case, if it had to be renewed, it might interfere with the stability of the building. There was, however, also a considerable saving in space; and that was a matter of importance in very many works—especially in works where they were at all cramped. Beyond this, the system was similar to that which had been in use in a great many gas-works. At Lower Sydenham, they had a purifier-house very similar to the one shown in the drawings, in which the india-rubber lutes were employed; and the purifying material was shot down in shoots like those described in the paper. They found that it was an economical arrangement, both for charging and discharging. It took up very little space, and could be constructed—purifiers and house together—at very little more cost than purifiers alone with the old lutes and in the old way. He thought one of the chief advantages of the paper would be in directing attention to this subject of purifier construction and gas purification. It was singular how little had been written, or how few papers had been read upon this subject, which, after all, was an exceedingly important one to the gas industry. They all knew of the experiments that were made at Belfast and Birmingham to effect the complete purification of gas in closed vessels; but so far as he (Mr. Shoubridge) was aware, these experiments, not having succeeded, had not been repeated, and nothing further had been done. He thought it was very much to be regretted that this was so. If anything had been done, the results had not been published; and this paper might have the effect of inducing some persons who were experimenting in this way to let either this Association or some other Association have the benefit of their work. It was somewhat a reflection upon the gas industry that the same methods of purification were in vogue now that were in use almost at the commencement of the industry—that the mechanical appliances for saving labour which had been introduced in so many other directions, had not been applied to any great extent in respect to purification. It was a subject to which, he thought, they ought all to give more attention, with the view of economizing in the cost of labour. Even in some of the largest gas-works the whole of the labour was now done by hand; and as it was labour of a kind that lent itself particularly to mechanical means, it was unfortunate that no one appeared to think it worth while to devote his attention to it. He hoped Mr. Lewis's paper would arouse fresh interest in the subject, which they all agreed was of great importance.

Mr. C. E. Botley (Hastings) remarked that the paper, which was very interesting, divided itself into two points—the construction of the purifier-house and the method of purification when one was under the sulphur clauses. Now, looking at Mr. Lewis's plans, it must be borne in mind that one had to design a purifier-house according to the requirements of the particular place and the ground area. He thought, with plenty of room, he should not feel inclined to have the revivifying-floor above the purifiers. They did not get that promptness and convenience in loading the purifier that they did if they had it on the ground level. The position, of course, depended very largely on circumstances, and on the site. He found Mr. Lewis suggested, with regard to the method of purification, that the use of air had not been altogether satisfactory. Well, he (Mr. Botley) could say that this was not correct, so far as his experience was concerned. They were under the sulphur clauses at Hastings; and they had been very successful for many years—even in keeping the sulphur down. They had an Official Gas Examiner who was not a local man, but one of the Metropolitan Gas Examiners; and he came at any time he liked. He had found the sulphur compounds as low as 4 grains; and he (Mr. Botley) did not think their average over the year would be more than 8 grains. And they used air in purification. He had read some interesting articles from the practical point of view of a gentleman who had had charge of the purification in a London gas-works, in which articles he said the use of air in purification for sulphur compounds was absolutely wrong. He (Mr. Botley) had tried both ways, with air and without; and he said most distinctly that with air they had the most successful results. They did not want to admit air indiscriminately, but they wanted to admit it according to the proportion of sulphuretted hydrogen there was in the gas. In this way, they had been able to keep down the sulphur compounds to a low point, and at a minimum of cost. Now at Hastings, it would not be considered they were favourably situated with regard to purification, to the cost of materials, and various other things; but when he told them that their purification charges, for materials and labour, had not exceeded ½d. per 1000 cubic feet of gas—keeping the sulphur compounds down to the low point he had described—they would not, he thought, consider that this was very unsatisfactory. Therefore, he was not able to agree with the statement that the use of air in purification, when they were under the sulphur clauses,

was prohibitory. On the contrary, he was convinced it was the right thing to do.

Mr. W. E. PRICE (Hampton Wick) asked the author how his hydraulic valve was used—filled and emptied. The object of these purifiers, he took it, was to do away with the water-lutes, and doing away with the objectionable blowing from excessive pressure, especially when the works were being run at high pressure. It seemed to him (Mr. Price) to be transferring the trouble from the purifier-covers to the valve. There was no doubt steel covers were the right things to use; but there came in the little trouble as to making the joints. He would like to know how the india-rubber acted under the influences of the gas. Was it necessary to treat the rubber in any way? Did it perish or become hard; and was it easily removed? Did it remain attached to the surface of the purifier, or was it raised with the cover? It was, he thought, rather a large piece of jointing to put in in one piece. He took it the covers would be not less than 12 feet square; and to raise a piece of rubber which would be perhaps 3 inches wide by ¼ inch thick would be rather a difficult matter.

Mr. S. W. DURKIN (Southampton) said he seemed to recognize in fig. 4 an old friend that he had had in use for some years. It looked like merely a section of Mr. George Livesey's gasholder manhole lid; and he had had the pleasure of paying a royalty for the use of a similar thing. He had for years used a hydraulic valve for purifiers, instead of the old slide-valves. It arose at the time when they used nothing but oxide of iron in the process of purification; and as those who had used the same purifying material would know, the discs of the slide-valves very rapidly became honeycombed, and there was constant expense incurred in keeping the valves sound or in keeping duplicate valves to replace those which had become unsound. The trouble grew to such an extent that he thought of an arrangement very similar to the one shown, and it was put in operation. Then he found it was a section of Mr. Livesey's gasholder manhole lid; and a small royalty was asked for it. But for this payment, he had power to use the things to any extent he liked. Anyway the arrangement had been working ever since. With reference to the use of air in purification, they were not brought under the sulphur clauses at Southampton until the latter part of 1898. But for some years before that—knowing it was very likely it would come about—they had been "practising" with air purification in connection with the lime and oxide boxes; and very successfully too. So when the legal responsibility came upon them to keep the sulphur compounds down below a certain number of grains, they had no difficulty about it; and they had continued to use air ever since. He did not say he got down so low as Mr. Botley did at Hastings. But 8 to 9 grains was all they got; and sometimes, when their make of gas had been pretty low in warm weather, they had disappeared altogether. On an average, however, they kept down to 8 or 9 grains. He therefore saw no reason why he should discontinue the use of air. Their purification was nearly all performed by lime at the same cost as had been mentioned for Hastings, excepting that there was a certain kind of gas made now which had a tendency to increase the purification charges.

Mr. D. H. HELPS (Redhill) inquired whether the author had considered, in using wrought iron in oxide purifiers, that it would tend to decay more quickly than cast iron.

Mr. J. H. BROWN (Ilford) said that some four or five years ago, they had 22 feet square purifiers erected at their works; and after about three years' working, the bolts in the purifiers needed taking out. They were affected by the liquor, and began to corrode. He could not, therefore, agree with Mr. Lewis in reference to the use of steel—especially at the bottom of the purifiers, where liquor from the oxide ran. With regard to air purification, he had had a rather peculiar experience. They were not under the sulphur clauses; and they had very few restrictions with regard to the purity of their gas. He was not using any lime whatever; and, by admitting air, he was able to obtain 40 per cent. of sulphur and 6 per cent. of "blue" in the oxide. He was obtaining for this 23s. 6d. to 24s. a ton; and they bought the new oxide at 16s. 6d. per ton. The result last half year was that they really made a profit of £5 on purification, as against a cost of £180 the previous half year. This, he thought, was a novel experience for a gas-works.

The CHAIRMAN said he had been particularly interested in the paper, as at Tottenham they had some purifiers that were constructed somewhat on the same lines—that was to say, they had india-rubber joints, and the bottom discharge. They were very much on the style of those shown in the diagrams. Regarding the bottom discharge, however, they had at Tottenham arranged the door to open on a vertical hinge, instead of a horizontal one, so as to make the door open and close more easily. The shoot was also curved, so as to bring the door upright. The lids at Tottenham were 12 feet by 14 feet, and of steel, with india-rubber joints. These had now been in use for about five years. The same rubber joints that were first put in were still in use; and he thought, from the look of them, they would be in use for about the next century if the purifiers lasted so long. (Laughter.) The rubber joints were quite as useful now as when they were first put in. In one of the purifying-houses at Tottenham, they had the revivifying-floor above the purifiers; and the chief difficulty, of course, was elevating the material up to the top. In building the new purifiers, they determined on the bottom discharge, so as to utilize the space below the purifiers for the purpose of revivification. In Mr. Lewis's scheme, he noticed that there was the space below; but there was also the revivifying floor above the purifiers; and he (Mr. Broadberry) had been wondering why there were both. He could quite understand the advantage of having a roof over the purifiers, which they had not at Tottenham; and they missed the roof during bad weather when they were cleaning the purifiers. But it did not seem to him to be quite necessary to have the revivifying-floor above the purifiers when there was space provided below.

Mr. A. F. BROWNE (Vauxhall) referring to the point as to the use of air in purification, said the author made this statement: "The introduction of air in purification has been of undoubted value in those happy places where sulphur clauses are unknown; but it is an unfortunate fact that it cannot be employed to the same extent under more rigorous conditions." He (Mr. Browne) did not think the discussion had so far brought out what each meant by the employment of air in purification. One speaker made his position very clear. He said he did not use lime; and he found a good effect in using air in his oxide boxes. Mr. Botley, on the other hand, employed air in lime purification with good effect. So they did at Vauxhall, with very good effect indeed. But it all depended upon putting in a known quantity of air, over which they had complete control, and not admitting it indiscriminately. In putting atmospheric air in the oxide boxes, they did so to throw down sulphuretted hydrogen, in the form of free sulphur; and in putting it into the lime purifiers, they did so, not for the purpose of arresting, but to drive forward the sulphuretted hydrogen into the oxide boxes. The members would probably remember that a very interesting paper was read before the Institution of Gas Engineers some few years ago by two professional chemists (Messrs. Hood and Salamon), upon the effect of putting atmospheric air into the lime box into which sulphuretted hydrogen was entering freely, but no carbonic acid. A very beneficial effect followed in the elimination of sulphur compounds, and what they described as "tender" sulphide was formed, which, when the carbonic acid reached it, was broken up; and the sulphuretted hydrogen was driven forward to the oxide purifiers, and the lime was very thoroughly carbonated in consequence. He (Mr. Browne) wanted to put in a word in favour of the use of air in lime boxes under these conditions; and he hoped the author of the paper in his reply would be able to tell them he meant the same thing.

Mr. R. HERRING (Dover) observed that he should like to understand from Mr. Lewis whether he admitted air in any percentage, or did he generally condemn it. He should like to know whether he advocated the entire exclusion of air or whether he allowed the use of any percentage at all.

Mr. LEWIS, in reply, said he thought Mr. Botley misunderstood him to a certain extent when he referred to the admission of air. He (Mr. Lewis) simply said that air could not be used to the same extent in the case of sulphur purification. They were using air at the present time at the Crystal Palace Gas-Works.

Mr. BOTLEY said it was the form of words to which he took exception—the words that air "cannot be employed to the same extent under more rigorous conditions."

Mr. LEWIS (continuing) repeated that they were using air successfully at the Crystal Palace works at the present time; but they could not use so much of it as they would like to. (Laughter.) Mr. Shoubridge and Mr. Helps had mentioned the use of steel and wrought iron in the boxes. From his experience in the construction of purifiers, if they once got rid of the water-lutes, then they had very different conditions. He thought in that case that, if they put a little extra thickness into the plates, that they had all they required in the way of weight. As a matter of fact, the steel might rust away at a slightly greater rate than would cast iron; but, on the other hand, they could let the steel run down to a much greater extent than they could cast iron. With reference to the question of bolts, he did not think it advisable to put bolts into purifiers constructed of steel or wrought iron. With regard to the floor of the purifier and the effect of drainage upon the floor, he had shown in the diagram the purifiers lined so as to prevent any action on the bottom plates. His suggestion was to line them with cement, asphalte, or something of that kind. Mr. Botley brought out an important point as to local conditions. Space, of course, was a great thing. If space was everything, then it was necessary to have not only the under floor but the upper floor. But if space was not of quite so much value, then they could very well be content with the lower floor for revivification, and simply cover the purifiers over. He could quite corroborate Mr. Broadberry in his remarks regarding the india-rubber used. At the present time the rubber they had at the Crystal Palace works was 1¼-inch by ⅜-inch section; and it seemed quite unaffected. The only thing that had happened to it was that when the lids had been screwed down the first time, when the pressure was released, the rubber lengthened. It was (say) about 40 feet long at first; and it lengthened about 18 inches when it was set free. All they did was to cut a piece out, and solution a new piece in; and it was as good then as ever before. The rubber rested on the purifier, and did not go up with the cover. With regard to the bolts employed, he thought the ordinary distance was about 1 ft. 6 in. or 1 ft. 8 in.; so that they were not nearly so close as had been supposed. With reference to Mr. Durkin's remarks regarding the valve. The valve itself was not new. It was simply an adaptation of a particular system. There was one point he should mention, that in the case of a valve of this

kind, he thought it was advisable to use, instead of ordinary water, some kind of liquid that was rustless. It would be necessary to have a tank on the ground floor, and one overhead for the purpose of dealing with the liquor and feeding the valve. A point had been raised regarding the blowing of purifiers. It was one of the advantages of the non-water seals that they did not get any blowing of the purifier, although he thought it was rather advisable at times to have something to blow somewhere. (Laughter.) Reverting to the question of the two floors, he said it was simply a question of space. He showed the two floors merely by way of illustration. The drawings did not profess to be an actual constructing example; it was simply a proposal. Of course, one floor or two could be adopted just as desired.

Mr. F. G. Cockey (Newport, Isle of Wight) contributed the next paper, which dealt with

DIFFICULTIES MET WITH IN THE CONSTRUCTION OF A CONCRETE GASHOLDER TANK.

In accepting the Hon. Secretary's invitation to contribute a paper at this meeting, I felt grave doubts as to my ability to produce one that would be of any service to the members or provoke discussion. In the management of a works of moderate size, where the staff is small, one has little time for research, or even for the systematic recording and classifying of facts, except in the somewhat unreliable receptacle of one's memory. The ultimate choice of a subject, however, was suggested to me by a recollection of the want I felt of records of similar pieces of work at the time I was called upon to design a gasholder tank to be placed upon a rather awkward site; and I venture to hope that a record of my own experiences may be of service to others in a like position.

The increased demand for gas had rendered the months of December and January periods of continual worry and strain for several years before my Directors could be persuaded to face the expenditure of capital necessary to place the storage capacity of the works on a safe footing; and it was late in 1898 before it was decided to put in a new holder. There was a piece of land available in an excellent position in relation to the rest of the works; and although on the slope of a hill, it did not at first appear to offer any great difficulties in the carrying out of the work.

The first consideration was the size of the holder; and this was governed by the shape and area of the land, which was such that, whatever sized holder was put on it, there would be no room for anything else. It was therefore decided to make the diameter of the tank as large as possible, and to put in only one lift of the vessel at present, which would practically double our storage, and provide for a good many years to come.

The treacherous nature of the ground in the Isle of Wight is well known to many contractors who have had the misfortune to carry out works in that beautiful, but unprofitable, district; and possibly had the advice of some of these gentlemen been available at the time, many of the difficulties afterwards encountered might have been avoided. But, as a rule, when a job is finished, if not before, they go away never to return.

A pair of large sewage precipitation tanks had been constructed a couple of years before on land adjoining the lower side of the proposed site; and by carefully watching the progress of these works, it was thought that a fair idea of the nature of the ground had been obtained. In order to get some further information, a trench was cut into the slope on the upper side of the site, which showed stiff, yellow clay; and this appeared to stand well. A shaft on the lower side showed similar clay at a depth of about 9 feet, with loose ground above, which was known to have been tipped there when the tunnel on the Ryde Railway was made some 25 years ago.

The choice of materials lay between steel, brick, and concrete. At first, a steel tank appeared to present many advantages; but on further consideration, there seemed to be several objections to the use of this material. In the first place, during the construction of the main sewer, it had been observed that the whole of the upper clay had a tendency to slide towards the river; and it would have been necessary to go to a considerable depth to get a foundation of approximately uniform resistance, and to obtain a sufficient abutment to overcome the tendency to slide bodily on the greasy surface of the clay. Secondly, although there is no difficulty in designing a steel tank to stand any given bursting pressure, it has little stiffness to resist distortion due to external pressure applied unequally on different parts of the circumference, as would have been the case in this instance; and to stiffen it sufficiently would have greatly increased the cost. These considerations appeared fatal to the steel tank.

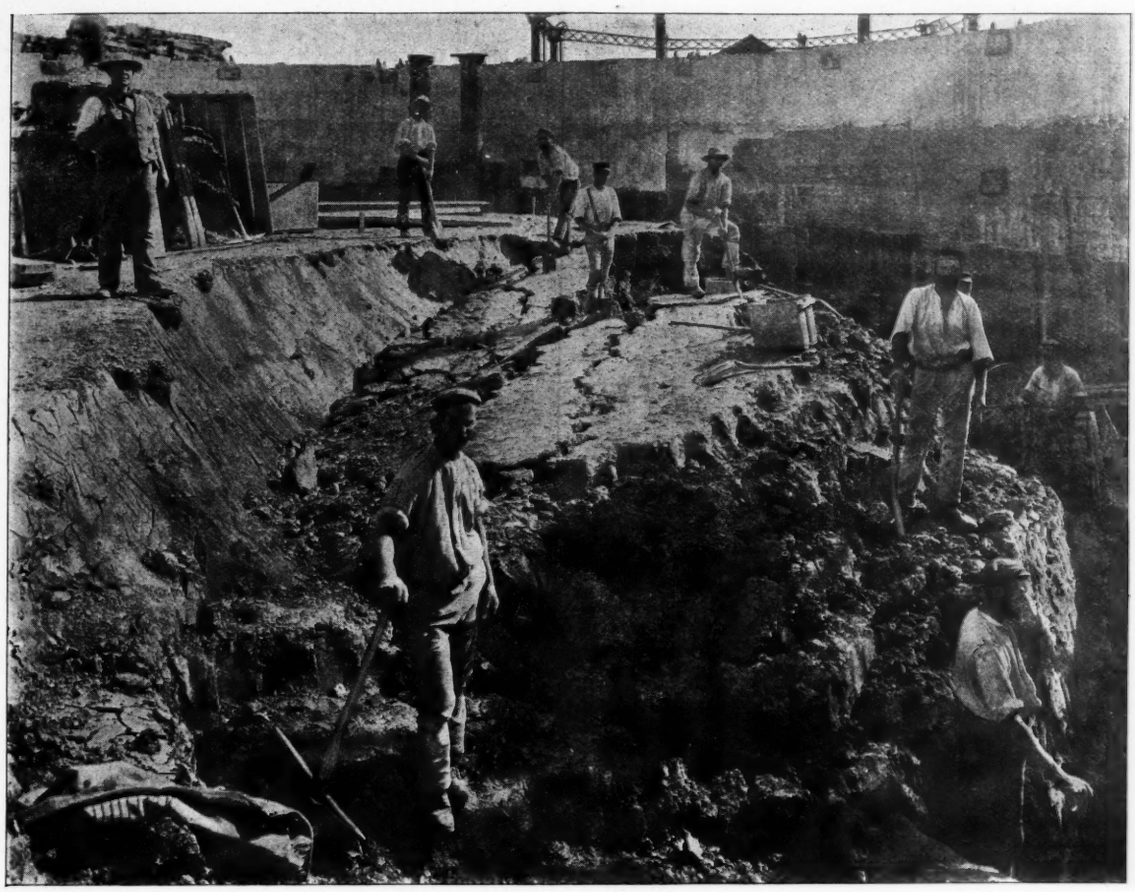
Between the other two materials, there was no difficulty in deciding. The homogeneity and rigidity of concrete, and the ease with which it can be made practically water-tight, would have been sufficient to turn the scale in its favour, even had it not been cheaper than brick in cement. The fact that excellent cement is produced within about a mile of the works, and could be delivered by water, and clean shingle in abundance was obtainable in the Solent and on the Hampshire coast, rendered this by far the cheapest method of construction.

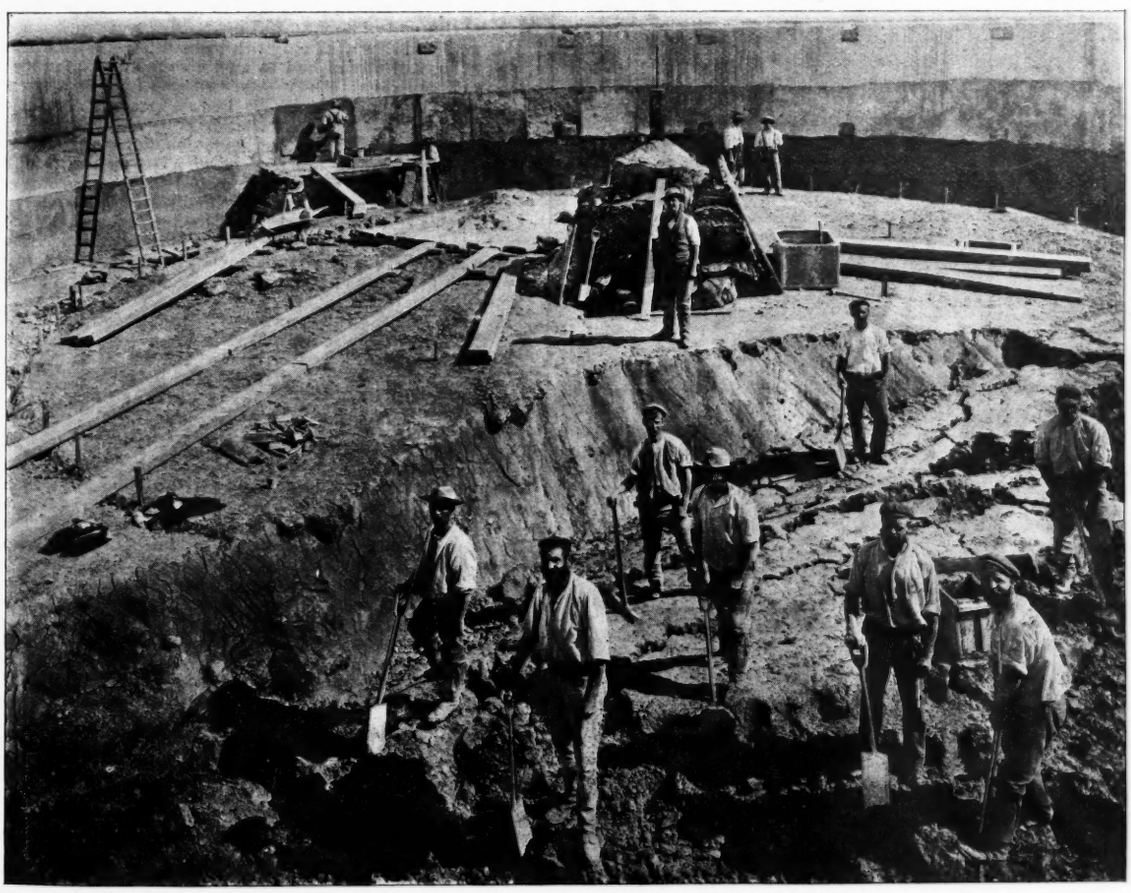
In deciding on the thickness and form of the tank wall and the level of the coping, the slope of the ground was again an important factor. If the tank were placed too low, the bank on the upper side would have been unstable; and, on the other hand, as the embankment on the lower side had to be made up, it was not safe to rely on it for much support. It was therefore decided to make the wall of a thickness calculated to resist the maximum bursting pressure at the bottom, taking into consideration the support due to the solid clay, and to carry it up of this thickness to its full height. There were other advantages in this method of construction that appeared to compensate for the extra quantity of concrete required—viz., the thickness at the top (3 ft. 6 in.) gave a sufficient base for the steel standards without any piers; and the vertical external surface enabled the concrete to be deposited in the trench against the solid earth, instead of having to form a battered casing and to fill in at the back of it.

The dumpling was originally intended to be a truncated cone, with a slope of 2 to 3, covered with a 9-inch casing of concrete. The inlet and outlet pipes were of cast iron, 18 inches in diameter, carried up the back of the wall, resting on a single casting forming a drip-box; the horizontal lengths being of steel bedded in the concrete bottom of the tank, which was thickened up at this point.

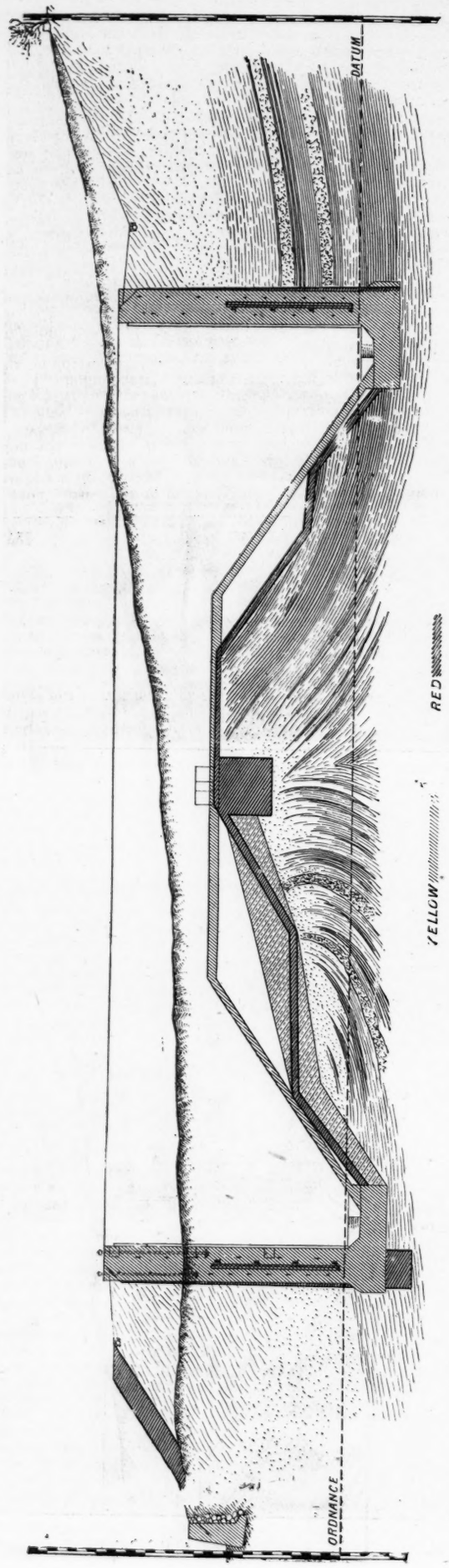
The contractor commenced work in January, by sinking a shaft at the point where the pipes were to be fixed, about 18 feet by 12 feet. This was carried down to the full depth, or about six frames, with poling boards and 6-inch square walings and struts; and throughout the whole job this never moved. This encouraged the idea that the ground was better than had been anticipated; and the ring was commenced 3 ft. 6 in. wide in clear of poling boards, with 11 inch by 3 inch walings and 6-inch die square struts—only about six bays on the upper side being timbered with 3-inch runners. All went well until about three frames of timber were in on the upper side, which brought the trench about level with the road on the lower side; but, unfortunately, the contractor, anxious to cart away as much as possible before the road was blocked, had been hard at work levelling the interior of the ring, and had also, in making a road for the crane, thrown his surplus soil on to the upper part of the bank. This disturbed the equilibrium of the ground; and the first sign of trouble we had was the appearance of several ugly cracks in the gardens on the other side of the hedge. At the same time the timber on the inner side of the trench began to rise until the struts were some 2 inches out of level, showing that the weight on the outside was lifting the core by fluid pressure. All hands were immediately turned on to remove the earth from the bank and tip it on the inner side of the trench, thus transferring a portion of the weight from one side to the other; and an extra row of walings was put in on the inner side below the others, with struts raking in the opposite direction to the acquired slope of the original ones. After several days of constant work, during which some 400 yards of earth was shifted, the movement ceased. This was tested daily for some time by checking the levels of plugs driven into the ground in the gardens above the bank with a point on a building some distance away from the works. It was found that the timber on the outside had come in about 1½ inches; but this could be got over by cutting out the runners as the concrete was put in, instead of leaving them in. By the time the fourth frame of timber was in on the upper side, the runners were well into the solid blue clay, and there was no further difficulty on that side. But as work proceeded on the south-west side of the ring, trouble again commenced. The yellow clay, which had appeared so stiff and solid in the trial holes, proved to be all alive, and poling boards were no use against it; while 11 inch by 4 inch pitch-pine walings required four struts in a 13-feet bay, which barely left room for the skips to work. There was evidently nothing for it but to put down runners behind the boards—this time on the inner side of the trench, as the pressure was now from that direction. It was also decided to increase the thickness of the wall, as we went down, to about 3 ft. 9 in. It may be mentioned that we had put down bore-holes at several points to ascertain at what depth the blue clay would be reached; and finding that on the lower—*i.e.*, west—side it was about 30 feet below the coping level, it was decided to carry the wall down 3 feet below the depth originally intended for some distance round this lower side, in order to get a good abutment to resist any tendency to move bodily. With some 25 feet depth of trench in this semi-fluid clay, the trench only 3 ft. 6 in. wide, so much timber in that there was hardly room to move, and the timber men working all night, the time was an anxious one; and everyone concerned was glad when the blue clay was reached, and it was possible to bottom up the trench and begin concreting. Under the circumstances, it was, of course, impossible to undercut the outer side of the trench as originally intended; and the concrete had to be placed as soon as a length had been cleared for it. Taking into consideration the enormous pressure on the upper side of the tank, which was comparatively unbalanced by any possible resistance we could apply to the rest of the circumference, it was decided to embed rings of railway metals, fished together at intervals, as the wall was carried up, with vertical rails to transmit any strain from one ring to another; and the proportion of cement in the concrete was increased from 1 part in 8 to 1 part in 7. This was undoubtedly erring on the side of safety; and I have now little doubt that the wall would have stood as originally designed.

The shingle used for the concrete was very clean; and the proportion of sand in it as delivered was exactly what was required to form a compact and impervious concrete. The cement





THE NEWPORT (ISLE OF WIGHT) GASHOLDER TANK UNDER CONSTRUCTION.



was of remarkably even quality, and in every case far exceeded the specified tests both in fineness and tensile strength.

When the concrete wall was brought up to its full height, it was hoped that our troubles were over; and the excavation of the interior of the tank was proceeded with, trimming the slope of the dumpling as the excavation went on. When about 18 feet of earth had been removed below the coping level, one afternoon a slight crack appeared on the levelled top of the dumpling; and in about five minutes a huge piece had separated itself on a line parallel to, and about 3 feet from, the north and south diameter of the tank, and slid gracefully down, leaving a beautifully polished slope. The whole of this earth was removed, and a bench formed at the bottom of the slip. The batter of the cone was increased, and the excavation proceeded with; careful watch being kept for further movements. The top was also concreted over, to prevent the rain from penetrating and further disintegrating the clay. In the course of this excavation, a most extraordinary geological formation was revealed, which is indicated by the coloured bands on the diagram. The north and south diameter of the tank appeared to be the anticlinal axis of a singular folding of the beds, which in one place were quite inverted; and it would have been hard to find a more unfortunate site for a tank, though no amount of isolated borings would have revealed this beforehand. These beds appear to belong to the upper Bembridge marls (a portion of the Oligocene strata), which are peculiar to this one portion of the British Isles. They are of fluvio-marine origin, and are characterized by bands of different coloured clays separated by beds of characteristic shells, with occasional bands of stone coloured by iron and interlaced with small roots. These shell and stone beds proved fruitful sources of trouble; for they broke up the cohesion of the mass, and further slips took place on the east side of the dumpling on the joints of these beds.

The ultimate section of the tank is shown in the diagram by the parts tinted red; while the original design is indicated by the parts coloured yellow. The shape of the dumpling will probably puzzle any engineer who may have occasion to empty the tank at some future time without knowing its history. As a precaution against further slips, a heavy buttress of concrete (3 feet wide) was carried up from the bottom of the tank to the centre pier, which consisted of a block of concrete 6 feet cube, with a cross-shaped rest-block on the top. Ribs or buttresses were also carried up at four other points; and after the whole was concreted over, no further movement took place. The interior of the wall was rendered with cement and sand 1 to 1, and finished with neat cement, killed and worked in with a trowel. The bottom and dumpling were well grouted with equal parts of cement and sand. On filling the tank, it was satisfactory to find that it lost only half-an-inch in the first twenty-four hours. This, by the end of about a fortnight, during which horse dung, hops, and middlings, mixed with cement, were from time to time put in, had diminished to an imperceptible quantity; and though for several months it was possible to detect a slight loss from week to week, the water-level now appears to remain practically constant.

The thickness of the embankment on the lower side was increased, as shown by the red tinting; and in this, and in the bank above the tank, two deep trenches were cut meeting at the top in the form of a triangle, and filled with large stones, to act as buttresses and drains and lessen the tendency of the banks to slip during wet weather. The surface of the slopes all round the bank was covered with about 4 inches of chalk, soiled over and sown with grass seed; and a drain was carried round the whole circumference of the tank.

In looking back on the work now in the light of the experience gained, one can see many points in which both the design and the methods of carrying it out might have been improved; and it was simply with the object of bringing out these points, and drawing forth the opinions and experiences of others, that I have entured to describe the work at such length.

Discussion.

Mr. J. W. Helps (Croydon) said he did not rise with the idea of discussing the paper, but rather to point a moral. It was only about three or four weeks ago that he approached Mr. Cockey, and asked him to read a paper. He kindly consented; and he (Mr. Helps) thought the paper Mr. Cockey had written was one which would form a no inconsiderable addition to the records of the Association. The sort of paper he had read was one which was particularly suitable for a meeting such as the present, though perhaps it would not lend itself so much to discussion as some of the papers they had had before them. It was an actual account of difficulties and experiences which an engineer had met with in the course of his everyday work; and he (Mr. Helps) thought there must be many members of their Association and others who, when they carried out certain works, could make records of the difficulties they met with, and the ways in which those difficulties were overcome. The Associations would thus have no trouble in getting many papers for their meetings.

Mr. W. D. Child (Romford) remarked that the members were very glad indeed to receive the information Mr. Cockey had placed before them as to the difficulties he had met with in dealing with this work in the particular part of the country where it was carried out. Some years ago Mr. Garnett gave an account of the peculiar formation of the soil in the Isle of Wight district, and the measures he was then obliged to take to prevent the slipping of large masses of earth. In Mr. Garnett's case, he

believed, at one time he was threatened with the slipping of the gasholder tank itself. They must all of them be pleased to know that Mr. Cockey had not only had the energy and resource to tackle this matter and bring it to a satisfactory conclusion, but he was glad that he found no difficulty in building a perfectly tight concrete tank. This appeared to have been in fact one of the least difficulties he had had to contend with—the rendering of the tank perfectly water-tight. From experience he (Mr. Child) had had in dealing with concrete, he felt that it really rested with the contractor or the contractor's men to perform the work thoroughly and well. If the concrete was well made and clean (cleanliness was the greatest essential), and properly put in, they might rely upon it far more than they had done in building works—especially tanks. He was glad to hear that Mr. Cockey had had no difficulty in this particular respect.

Mr. D. H. Helps (Redhill) inquired whether Mr. Cockey, in designing the work described, considered the advisability of using expanded metal in the construction of his gasholder concrete tank. He had himself been considering the question of tank construction a good deal lately; and he thought the amount of concrete might be much reduced by expanded metal. Sir Benjamin Baker had stated that a concrete slab 5 inches thick and 6 ft. 6 in. apart with expanded metal was ten or eleven times stronger than the same slab without expanded metal; and he also proved that expanded metal was very nearly as useful in an arch. He (Mr. Helps) therefore thought it was worth the consideration of anyone who was going to build a concrete tank whether expanded metal should not be used. Of course, one would have to consider the best place to put it; and, though he had not gone very far into the question, he should suppose it would be best placed in two positions—on the outside circle of the tank and again on the inner circle. He believed expanded metal would occupy a large part in all structural work in the future. In considering the strength of tanks, he believed it was usual when building a steel tank, if it was put into the ground, to make it strong enough to take the bursting pressure of the water without any assistance from the soil. A brick-rendered tank was not built strong enough to take this pressure without assistance; and so, why one should be built strong enough and the other not, he had often wondered.

Mr. T. Price (Walton-on-Thames) said he had recently constructed a concrete tank on similar lines to Mr. Cockey; and he was thankful to say he had not had the difficulties that Mr. Cockey had experienced. His greatest difficulty had been (as Mr. Child mentioned) in making the tank water-tight by rendering. He thought perhaps the soil that Mr. Cockey's tank was in—stiff yellow clay—had had something to do with his success in this respect.

Mr. Percy Griffith (London) said he had had experience in constructing concrete tanks, but they had not presented anything so interesting and novel as Mr. Cockey had described in his paper. At the same time, the paper had confirmed the opinion which he (Mr. Griffith) had formed as to the use of concrete for such purposes. He had used it for water-works reservoirs, as well as for circular gasholder tanks; and in both cases he had found it compare very favourably, both as regarded strength and cost, with any other form of construction which was used. He thought the author might perhaps emphasize the fact which appeared to him (Mr. Griffith) in connection with the difficulties he had encountered at Newport—that the construction by concrete was peculiarly and especially favourable for overcoming the difficulties he met with, particularly when there was a danger of the bottom of the trench breaking in. He assumed he was able to put all the concrete into position—that was to say, to bring weight to bear upon the bottom of the trench—very much more rapidly than he would have been able to do with brickwork. He (Mr. Griffith) had had experience also in keeping tanks water-tight under both methods of construction—brickwork with puddle backing, and concrete rendered on the inner face; and his experience had shown him most conclusively that it was far easier to get work carried out efficiently with concrete and cement rendering than it was with brickwork and puddle backing. Both puddle and concrete required careful supervision or they were both equally dangerous. This, he thought, was an opinion that would be shared by all who had had experience of the two. He, however, considered it was far easier to overcome the difficulties encountered in rendering concrete water-tight than in overcoming the difficulties to be met with in various grades of puddle.

Mr. J. S. Ineson (Ventnor) said that, coming from the immediate district where Mr. Cockey had constructed his tank, he could sympathize with him in the difficulties he had had to contend with. Altogether perhaps the difficulties had not been so great as his (the speaker's) on the southern side of the Isle of Wight. They had there a different geological formation from that at Newport. In fact, some of the strata of the island seemed upside down; what should be at the top was very often found at the bottom. In his part of the district, they were particularly troubled with what was called "blue slipper;" and it was a very appropriate name indeed, for it was continually slipping. He remembered vividly 16½ years ago, when he first went to Ventnor. The morning after his arrival, not having seen the works, he went down to look at them; and when he got to the top of the hill overlooking the works, to his astonishment he found one of the gasholder columns upside down—the minaret at the top was pointing to the centre of the holder; and two other columns were completely smashed up at the base. They appeared to be slipping towards the sea; and the holder was about 2 ft. 6 in. out of its circular diameter. He had to commence at once to face these great difficulties, and patch up the holder tank, and bring it into a true circle again. Through perseverance and a use of concrete, he brought it into true circle; and it was working very well down to to-day. It was something like 4 inches out of diameter even now; but it was perfectly tight. The distance from the top of the sea wall to the inside of the tank was only about 10 feet.

The Chairman thanked Mr. Cockey for the useful information he had laid before the Association. He felt sure there must be many of the members who had had considerable difficulties in the construction of their tanks, and probably would have considerable difficulties in the future; and a paper such as that just read, and the discussion it had given rise to, would certainly help them very considerably in providing against similar contingencies. The paper seemed to sound a note of warning against building gasholder tanks below ground in the Isle of Wight; and it would be a good plan for engineers in future to consider the advisability of having steel tanks above ground. In the works of which he had charge, they had fortunately very good soil for the construction of tanks. They had about 16 feet of excellent ballast, and below that they got at once into the London blue clay. This formed a very good bottom for a tank, and it lent itself admirably to the construction of brick-and-puddle tanks. But as he said before, in cases such as Mr. Cockey's, he should be disposed to consider the advisability of having a steel tank in preference.

Mr. Cockey, in reply, said the main point he wanted to bring out was that they had no means of foreseeing the difficulties they would have. The singular formation was quite unforeseeable; and they did not find it out until they got on to the tank. The question of steel tanks did occur to him; but he was confident that a steel tank on this particular site would have slid away downwards. Mr. Child had brought out the point about making concrete water-tight; and he (Mr. Cockey) quite agreed with what he had said in this regard. It was merely a question of careful supervision, clean ballast, and a fair proportion of sand. The concrete was laid on a stage, shot down a vertical shoot, turned over again at the bottom, and then put in place with a shovel and sharp tools, so as to work out all the air from it, which, he thought, was an essential point. It was only fair he should say a good word for the excellent workmanship all round. He had had no trouble with the contractor; although, possibly, he was losing money the whole time. With regard to the expanded metal of which Mr. Douglas Helps had spoken, he (Mr. Cockey) was anxious to try it in a gasholder tank. He did not, however, quite see his way to use it in this instance. He had omitted to say that in the tank there were rings of 1½ inches by $\frac{3}{16}$-inch hoop-iron bedded in at about intervals of 1 foot the whole way up. But he should very much like to have an opportunity of putting in a small tank with expanded metal, just to see what could be done with it. With regard to the bursting pressure of a tank supported and unsupported. It appeared to him that, when they went down in solid ground, if they had sufficient weight above to form a fluid pressure, they must be able to derive help from the ground. And this was the reason why, with a steel tank, they did not reckon upon the support of the ground outside—that a steel tank was weak to resist external pressure, but not internal. He did not think in their case they derived any material assistance from the clay in keeping the tank tight, because there were the beds of stones which carried the water. At one point they had some difficulty getting the tank tight; and there they had a little soft place, which they filled up from the top after the job was finished. Another great point about the concrete was the facility with which the trench could be filled in in troublesome ground.

Mr. A. W. Onslow (Woolwich Arsenal) read the last paper on

HIGH-PRESSURE GAS FOR INCANDESCENT LIGHTING.

We now look to an increased pressure of gas beyond that usually supplied from the works for general use, as a familiar matter; but I do not propose dealing with the question for any other purpose than giving effect to the incandescent lighting, beyond mentioning that the principle of high-pressure gas in mains generally has been dealt with in the Technical Press lately. Probably the time will come for mains to be charged with pressure at so many pounds per square inch, so that ordinary street-lamps can supply illuminating power to any extent without difficulty—counting the candle power by hundreds—thus rendering individual efforts to overcome the difficulty unnecessary. At the present time, however, we must look to water or other means for motive power to do the work.

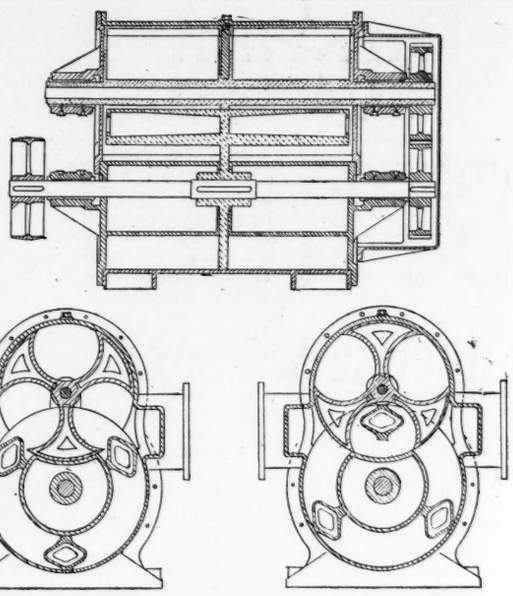
High-pressure gas has now been in use about three years. One of the first forms was the hydro-press. The pressure can be increased to any extent up to the point when the mantle is blown off the rod, provided sufficient water pressure is available in the mains. One of the drawbacks was the excessive use of water; and the cost, not only of supplying the water, but also dealing with the waste, had to be considered. This is now modified by economical use of water and other improvements; and without attempting to describe the various systems at present in use, suffice it to say that the Keith, Sugg, and other apparatus deal with the power so fully and well that a perusal of the systems

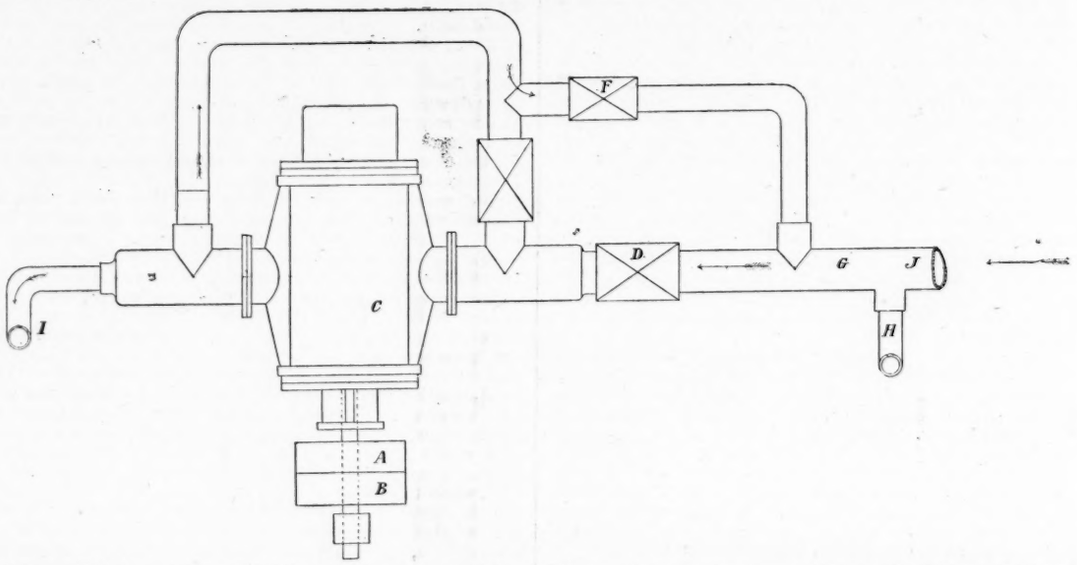
will repay any consumer of gas when considering the subject for future use.

Before high pressure can be available for intensifying the light, the burner must be improved; the "C" Welsbach being useful up to a point not exceeding 1-inch pressure, thus proving that the mantle was sufficient and ahead of the burner. Then the Kern or its prototype appears, carrying the burner and mantle together so far as the relative value of each is concerned, until a point at about 8 inches is reached. The "C" burner gives a value of 15 candles per cubic foot of gas; the Kern burner gives 25 candles at 1-inch pressure; and this gradually increases until, at 8 inches, the illuminating power is 30 candles, or 240 candles for 8 feet of gas, with a 70-cotton mantle. At this point the maximum light is reached with this burner and mantle.

I might add that in all the experiments mentioned herein the results are with a new or comparatively new mantle. From 8 inches pressure, it is necessary to alter the burner and mantle; the fibre of the mantle must be strengthened, and the air space modified. The following tests show the importance of closely watching this point, and, of course, compel one to keep this in view always.

The following results of several tests made by the Welsbach Company with a No. 4 burner and mantle, at 54 inches of water, may be very useful. It was found that 30-cotton single mantles held their shape better than any other size. The gas-way was 0·85 mm. diameter; and 14 feet of gas was consumed at each test. The ordinary Kern gave 205-candle power, or 14·6-candle power per cubic foot of gas. Four circular air-holes, 7 mm. diameter, gave 332-candle power, or 23·7 candles per cubic foot. Four circular air-holes 6·5 mm. diameter gave 423-candle power, or 30·2 candles per foot of gas. Four circular air-holes 6 mm. diameter gave 433-candle power, or 30·9 candles per foot of gas. Four circular air-holes 5 mm. diameter gave 318-candle power, or 22·7 candles per foot of gas. So that the gas must be kept at a uniform pressure to ensure this; and apparently the efficient power of the mantle that is made up to the present time is obtained, and cannot exceed 30·9 candles per cubic foot of gas.





One of the questions to be considered is: "Does it pay to go beyond 8 or 9 inches pressure, and have fewer number of burners, but the life of the mantle to be considerably reduced thereby, or to have more burners (the number would be doubled to give the light at 8 inches over that at 54 inches)?" The incandescent ordinary burner was looked upon as the acme of lighting at one time; but powerful arc lamps must be used now, and the demand continues for more light—not merely for dark corners, but a brilliant one everywhere in shops, factories, and streets—until one pauses to think, When shall we get to the end of this extraordinary run into thousands of candle power, where single candles a few years ago was considered sufficient? But as the cry goes out, we must compete; and if thousands of candle power are demanded, I suppose they must be given. And when we come to the happy state that hundreds of thousands and millions of candle power for such-and-such a street is required, I do not see why gas should not supply the demand. I am very sanguine as to the value of a mantle, if it can only be made to stand the pressure a burner can give; but, of course, the texture must be stronger at the nearest point to the flame, so that none of the flame passes through the interstices of the mantle.

When we tried the Hydro-Press Company's first apparatus, the light said to be given was 600-candle power for a No. 4 burner; but this cannot now be accepted. Certainly, the latest form of mantle (30-cotton) will not give this light, although my tests with a Continental burner consuming 11·82 cubic feet of gas per hour furnished a very effective light, and was sufficient to enable anyone to read newspaper print comfortably at a radius of 24 yards from the lamp; the nearest ordinary flat-flame lamp being 80 yards away. This test was with a double mantle; and though the appearance and power of the single 30-cotton mantle is good at first, I am inclined to the double mantle, as it does not curl up a few hours after use, and should last for about 200 hours indoors before its lighting effect is materally impaired. I have had one last for 250 hours, and the light given was extremely good; but its appearance as a thing of beauty was not favourable.

It is possible to obtain high pressure without water, though this is no doubt useful where applicable; but a factory with running machinery can supply the power to any extent, with a suitable apparatus, at a trifling cost. The question whether the cost of a small engine is desirable in large factories counting the number of lamps by hundreds, is one to be seriously considered; but the use of power in workshops with machinery already at hand is dealt with only in this paper.

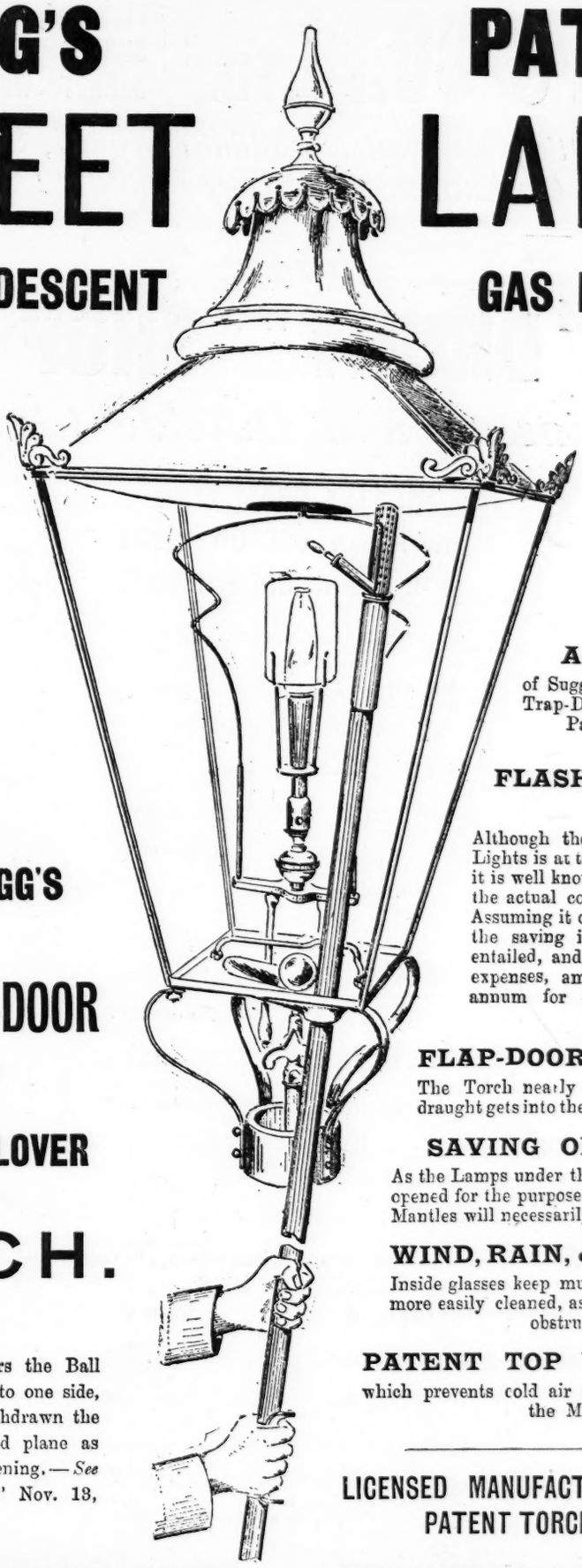
Ordinary blowers, or fans, will give 7 to 9 inches without difficulty; but if we want 50 inches or thereabouts, an exhauster or strong blower is necessary—not the exhauster for choice, owing to its powerful or non-elastic action. A blower which is used largely for supplying air for smiths' fires, is very suitable, and can be driven at 400 revolutions a minute. This alone is an advantage. The gas waves are not observable—in fact, the pressure may be said to be quite equal.

The method of using this apparatus, as shown by the diagram, is as follows: A is a fast, and B a loose pulley, driven from a shafting overhead. C is the blower. D is a valve on the inlet to the blower. F is a bye-pass or safety-valve, which can be weighted to any extent, so that as soon as the pressure arrives at that intended, the surplus is passed back into the inlet-service; and so well does this act that, as each burner is shut down, the pressure does not vary. G is the inlet-pipe. H is a bye-pass for the pilot-lights. I is the inlet to the burners.

The blower is now working at 100 revolutions per minute. The inlet pressure before starting the machine at 5 p.m. was 15-10ths, and the same at 8 p.m.; the pressure of 14-10ths at

SUGG'S PATENT STREET LAMPS

FOR INCANDESCENT GAS LIGHTING.



FITTED WITH

WILLIAM SUGG'S

PATENT

BALL TRAP-DOOR

FOR LIGHTING WITH THE

FOULGER-GLOVER

PATENT

TORCH.

The Torch, as it enters the Ball Trap-Door, pushes the Ball to one side, and when the Torch is withdrawn the Ball runs down the inclined plane as shown, and closes the opening.—*See "Journal of Gas Lighting,"* Nov. 13, 1900, p. 1203.

ADVANTAGES

of Sugg's Patent Lamp, with Ball Trap-Door, and Foulger-Glover Patent Torch combined.

FLASH-LIGHTS ABOLISHED.

Although the usual charge for Flash-Lights is at the rate of $\frac{1}{8}$ cub. ft. per hour, it is well known to Gas Engineers that the actual consumption is far heavier. Assuming it only amounted to $\frac{1}{3}$ cub. ft., the saving in By-Pass Gas, Labour entailed, and other necessary incidental expenses, amounts to over £30 per annum for each District comprising 80 Lamps.

FLAP-DOORS ABOLISHED.

The Torch nearly fits the opening and no draught gets into the Lamp when being lighted.

SAVING OF MANTLES.

As the Lamps under this System need only be opened for the purpose of cleaning, the saving in Mantles will necessarily be a very important item.

WIND, RAIN, & DUST-PROOF.

Inside glasses keep much cleaner. Lamps are more easily cleaned, as there are no flash-light obstructions.

PATENT TOP VENTILATION,

which prevents cold air from striking the top of the Mantle.

LICENSED MANUFACTURERS OF THE PATENT TORCH SHOWN.

WILLIAM SUGG & CO., LD., VINCENT WORKS, WESTMINSTER.

EVERED & CO., LTD.,

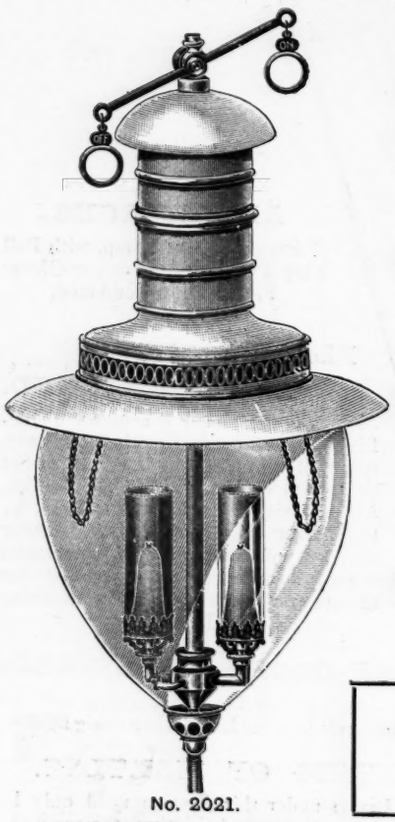
27 TO 35, DRURY LANE, LONDON.
SURREY WORKS, SMETHWICK.
BARNET WORKS, BIRMINGHAM.

Brass Gas-Fittings Manufactory—SURREY WORKS, SMETHWICK.
Wrought-Iron Gas-Fittings Manufactory—DRURY LANE, LONDON.

THE

NEW "DRURY" SHOP LAMP

For Inside and Outside Lighting.



No. 2021.
WINDOW LIGHT.

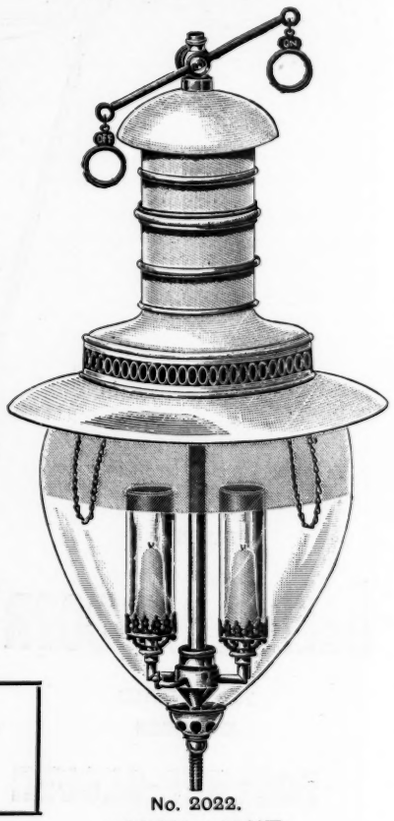
NEATLY ENAMELLED
IN FAWN COLOUR WITH
WHITE AND GOLD RELIEF.

No. 2020 is for Inside Lighting, with clear flint Globe.

No. 2021 is for Window Lighting, and has a diagonally obscured Globe.

No. 2022 is for Lobby Lighting, and has an opal top Globe.

A similar Lamp made for Electric Light.



No. 2022.
LOBBY LIGHT.

Prices:—

	1-Light.	2-Light.	3-Light.
No. 2020	40s. 6d.	52s. 6d.	58s. 6d. each.
No. 2021	42s. 6d.	55s. 6d.	61s. 6d. „
No. 2022	50s. 9d.	66s. Od.	72s. Od. „

Subject to Trade Discount.

MANUFACTURERS OF

Gas Joints in every form suitable to the requirements of Gas Companies and the Trade generally.

1st. Take out Seal Screw and remove Handle.

PREPAYMENT METERS

Price Changing *in Situ.*

OUR PRICE-CHANGING SYSTEM as Illustrated is the simplest, quickest, and most accurate yet devised. **NO NEW WHEELS OR PARTS** are required; and the arrangement is entirely covered over and sealed.

ALL PARTS INTERCHANGEABLE.

GUARANTEED FOR FIVE YEARS.

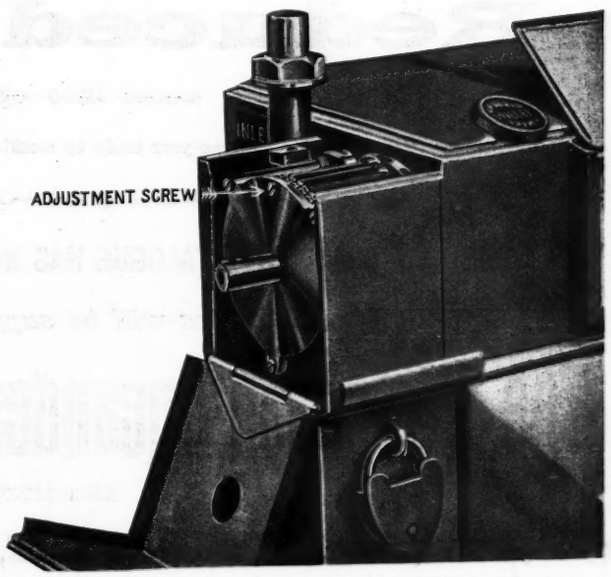
Cannot be tampered with through the Slot.

Slot closed when maximum number of coins are inserted.

Tens of Thousands in use and adopted exclusively by many Gas Companies.

2nd. Swing over Cover and remove Adjustment Screw.

Exclusive Contracts in operation for **FITTING UP HOUSES** including **THE MAINTENANCE** of the **FITTINGS** and **METERS** in Plymouth, Swansea, Devonport, and Newport.



3rd. Turn loose Ring until number of feet required is opposite arrow, replace Adjustment Screw and Re-seal.

Willey & Co.,

LONDON & EXETER.

THE POPULAR DEMAND

for the

has increased by over

50 per cent.

since June 1st, the date on which the

Reduced Prices

came into operation.

You can easily increase your trade by stocking the Company's various accessories.

THE NEW SEASON'S CATALOGUE HAS NOW BEEN ISSUED TO THE TRADE.

Further copies will be supplied on application to

The Welsbach Incandescent Gas-Light Co.,

LIMITED,

YORK STREET & PALMER STREET, WESTMINSTER, LONDON, S.W.

7 p.m. being due to the works pressure in the mains. The oscillation shown on the register (fixed at J on the plan), through passing the gas back into the inlet, never exceeded 1-10th; and this could no doubt be overcome if causing any trouble. This machine is supplying eleven No. 4 burners.

The size of the pipe at the main 60 yards away is 1½ inches, and is only increased to 2 inches 20 yards from the blower, and again to 3 inches at the blower itself. This is no doubt an advantage to fill the small reservoir, though I have drawn the gas from a 1-inch pipe, and passing the surplus gas back into the same pipe, and having already twelve burners to light before reaching the blower, the burner on the suction supply nearest the apparatus (about 6 feet away) was extinguished, and each light flickered 20 yards off. The flickering was reduced as the distance increased; but the remainder of the shop lights were unaffected, as were the burners on the high-pressure supply.

The blower now in use is capable of dealing easily with upwards of 200 burners, having 3-inch inlet and outlet holes. The loose pulley is running when lights are not required. The pilot-light valve H was provided at first, and was to be opened just far enough for a glimmer in each burner; but the blower was found to pass enough gas to keep the burners going, and this is useful, supposing the shafting to stop for repairs. On lighting up, the machinery attendant merely pulls the slide from the loose to the fast pulley.

A pilot-light of (say) ½ cubic foot of gas per hour for each burner is probably to be preferred; the supply to be independent of the high-pressure gas—being connected to the nearest ordinary supply. Of course, the lamps and pipes by this arrangement are entirely separate from the ordinary gas supply; and the pipes and fittings should be of good quality and well put together.

And now for cost. The gas that is consumed by the latest No. 4 Kern burner made by the Welsbach Company is 14 cubic feet an hour at 54 inches pressure. The life of an indoor mantle can be taken at 200 hours; and those in street-lamps (after providing for rough usage or other causes beyond fair wear) might be taken at 150 hours. On this basis, I have estimated the cost.

	Per Hour.
Mantles—1s. 6d. each, 150 hours	0·12d.
,, ,, ,, 200 ,,	0·09
14 feet of gas per hour at 1s. 4d. per 1000 feet (the price of gas made in the Arsenal)	0·22
14 feet of gas at 2s. 6d. per 1000 feet	0·42
Pilot-light (average) 24 hours	0·02
Add for depreciation of lamp and burner, renewal of rods, and labour in fixing mantles, &c., and providing power	0·18

We find then the cost as follows:—

	Per Hour.
Gas at 1s. 4d. per 1000 cubic feet, and mantle to last 150 hours, together with depreciation	= 0·54d.
Gas at 1s. 4d. per 1000 cubic feet, and mantle to last 200 hours, as above	= 0·51
Gas at 2s. 6d. per 1000 cubic feet, and life of mantle 150 hours, as above	= 0·74
Gas at 2s. 6d. per 1000 cubic feet, and mantle to last 200 hours, as above	= 0·71

This 0·18d. represents, in 14 days' use of 200 mantles and burners, a sum of £22 10s.—certainly sufficient to pay any charge likely to be met. I therefore think ¾d. per hour is a fair estimate for the net cost of a 433-candle power lamp; or 1299-candle power in a 3-light lamp for 2¼d. per hour. This will, I venture to say, compare favourably with any other method of lighting. Of course, if three burners were placed in one lamp, the cost for depreciation should be less, and the corresponding labour for cleaning and keeping the lamps and fittings in working order.

I might add that it is desirable, even in buildings, to put the burners in a suitable lamp; and now that the distributing wheels in the burner have straight teeth instead of angle ones, the whistling noise, so unpleasant—due to burners, and in some cases to the lamps—can be avoided.

[Mr. Onslow, at the close of the paper, called attention to one of the burners which was used at the Arsenal with 54 inches pressure. He pointed out that it had straight teeth, whereas the ordinary Kern burner had angle teeth. The noise with six burners with angle teeth would be almost unendurable. He thought he had gone to the maximum in regard to cost, because 0·18d. was a large amount to take for depreciation, rods, &c. He found a man had only to attend to these lamps once a month; and he had no difficulty at all with them.]

Discussion.

Mr. C. F. Botley (Hastings) said the paper appealed to him somewhat, inasmuch as he was about to fit up an installation at Hastings. Taking the paper as it stood, he was afraid it would be a long while before they had high-pressure mains for ordinary distribution of gas. There were so many practical difficulties in the way. They might have separate mains; but it would involve great expense in several ways, although it would be very convenient to have a high-pressure supply. With regard to the durability of the mantles, he was particulary struck with a remark of a firm dealing with this matter of high-pressure lighting—that the mantles would last as well as in ordinary incandescent lighting. He could not quite believe this; and he gathered from what the author said in his paper that it was not so. But, working at high efficiency, if the mantles lasted 200 hours, as indicated in the paper, he should be very well satisfied. In regard to intensified lighting for street purposes, he was afraid they would have to get their friends to add a few thousand candle power to the burners, even before they could take the cost mentioned, of 2¼d. per 1300-candle power lamp per hour, because they would find many electric companies were supplying 2000-candle power lamps for that figure, or rather what they called 2000-candle power lamps, though they were not. The little blowing arrangement which the author had introduced to them was very admirable. Having a bye-pass enabled the difficulty to be overcome (which would naturally be felt where the blower was kept running by machinery which varied in speed) of the pressure fluctuating too much; and in a place like the Arsenal, where there was plenty of machinery, something of the sort would be very useful. At present, he (Mr. Botley) was going to use water-power; and he was hoping to have an installation of 6000-candle power, which promised to be very successful.

Mr. H. H. Jones (Wandsworth) was quite sure that everyone in the room would agree with this: That the question of incandescent lighting was of the most vital importance for gas undertakings not only for street lighting, but for domestic lighting. It was their one lever in these days against the competition of the electric light; and the lever, so far as he had been able to use it, had been in the question of cost. These high-pressure systems, of which there were now several, were, in the first instance, confined to places like stations (he believed the Great Central Station was one of the first), open spaces, big factories, and other places where it was possible to lay a duplicate system of mains, and have a pressure raiser. They were also within measurable distance of seeing what they could do with the Scott-Snell lantern, which was self-contained. But they had to look at the question from the economical point of view. Taking, for instance, his own district. They were very go-ahead with incandescent lamps. One of his parishes—Putney—he believed was the first in the County of London to entirely adopt incandescent lighting; and in Wandsworth they were advancing very fast. The parish were converting the rest of their lamps in instalments each half year, paying for the lanterns, burners, &c., out of revenue or the ordinary lighting rate; and, using a No. 4 "Kern" burner, now that the price of gas was 2s. 6d. per 1000 cubic feet, the cost was practically the same as if the ordinary 5-feet flat-flame burner was used—the cost including the price of the mantles, and the labour in fixing them. This last worked out at something like an average of 3s. per lamp per annum. The consumption of the mantles averaged nearly six on their 4300-hour lighting table. If, however, they were going to bring the mantles down to the average of 200 hours mentioned in the paper instead of what his number worked out to, they would add tremendously to the cost. Then, again, he took it that these high-power lamps (which could only compete with electric arc lights) would only answer for central situations—such as refuges, crossings, and big open spaces; and, this being the case, they would have to wait a good long time before they saw any universal introduction of them. Of course, in big works where machinery was running, and where the necessary power was easily obtainable, the high-pressure system would have advantages that it would not have in other places. Therefore he thought that, for general purposes, they wanted a much greater development—a greater pulling together as it were—in regard to the introduction of the ordinary incandescent gas-burners, which had to compete (both indoors and out) with the incandescent electric light, and which gave all the light that people wanted in the streets. Altogether it seemed to him the opening for these very big lights was restricted.

Mr. W. H. Y. Webber (London) said, from what he had seen of the high-pressure system in operation up to the present time, it was bound to come, and he thought it would come very fast. It seemed to him that the objections to distributing gas at a much higher pressure than had hitherto been customary were largely of a hypothetical nature. There were such things as reducing-valves; and the problem, after all, was nothing near so difficult as Pintsch's people had to solve in the lighting of railway trains. It was certainly not so difficult as the natural gas people had to solve in the States, where they piped gas away for scores, and even hundreds, of miles, at somewhere as high as 400 lbs. per square inch. One of the gentlemen who did this was telling him only the other day that, when they decided to go into the question of high-pressure gas distribution for the particular purpose of lighting an outlying village through a 3-inch pipe, they found a diminishing governor quite ready to their hand. This was really the only thing they wanted to go straight away; and, with the same system, they could work the high-pressure street-lamps, from this somewhat startling pressure of 54 inches down to the normal high-pressure average of about 8 to 9 inches. The whole thing opened up the very widest horizon, and the brightest promise for the gas industry. He did hope that no mere superstition about the dangers of working at high pressure, or anything of that kind, would be allowed to stand in the way of the fullest advantage being taken of the mechanical aids to improve gas lighting which the industry now possessed.

The Chairman, in closing the discussion, said he did not think there could be doubt in the minds of any of the members that this system of high-pressure lighting was going to be of very material benefit to the gas industry in the future. The electric light had already found that it had had a considerable set-back; and he believed that the improved incandescent gas-light which

this high-pressure system gave them would be instrumental to a large extent in his district in checking the advance of electricity —in fact, he might say of nipping it in the bud.

Mr. Onslow, replying to the discussion, said, with regard to the pressure at which he worked, he had been told, and had been impressed upon by certain people, not to go beyond 8 inches for incandescent lighting. To this his answer was that, if a mantle maker and a gas-burner maker would supply him with a mantle and a burner to take 180 inches, he was quite prepared to work at that pressure. He liked to have the idea before him that he had got to 54 inches, and that there was a possibility of going higher, and not confining himself to the low pressure of 8 inches. He did not see why, if mantles could only be made strong enough to suit higher pressures, an incandescent burner should not easily give 1500 and 2000 candle power. Take a No. 7 Kern burner and mantle, if they put 54 inches on them, the mantle was blown away; it was destroyed at once. This, however, was the fault of the mantle, not of the burner. Could not, he asked, a mantle be made to suit the burner? Mantles were made to suit the No. 4 burner; but the makers did not seem to try to suit the No. 7 burner. The ordinary mantles were 70-cotton ones; and they got 30-cotton ones for high pressure. If the makers would double and strengthen them, so that the pressure could be increased, there was no end to the future of the high-pressure system. There were several other matters he should liked to have touched upon; but he would confine himself to one. In his own case, he had to light as well as make gas, and he had also to be economical. Though his make of gas was very large, and there were some 25,000 men who had to have light, they had to have it economically. He had to consider the question of the economical use of some 350 million cubic feet of gas which they made at the Arsenal; and therefore it was a vital question, not only for himself, but for others, whether they could not increase the illuminating power and reduce the cost.

Mr. Webber asked to be allowed to supplement his previous remarks with the observation that there was not the slightest fear that a mantle would not stand all the blast they could put upon it. Anyone who had seen the process of firing ordinary incandescent mantles as they were formed with a high-pressure blast of gas and air would bear him out. They were raised by this means to a degree of incandescence so dazzling that the workmen had to use a dark glass lens to look at them. The way in which these comparatively fragile mantles (simply suspended from the top) would stand these high blasts was almost a complete proof that mantles could be made to stand almost anything that they liked to put on them in the way of a blast.

A Vote of Thanks.

The Chairman said the most hearty vote of thanks was due to the authors of the three papers. The Association had had a record meeting, and a full one, with interesting discussions. He thought the large attendance was probably due to the fact that the members knew the papers were to be of special interest. Therefore, for this successful meeting, they had to thank the gentlemen who had kindly prepared these contributions to their proceedings.

Mr. Percy Griffith, in seconding the motion, also remarked upon the value and interest contained in the papers.

The motion was unanimously passed.

Tea was then served; and this made a pleasant conclusion to a most successful meeting.

PHOTOMETRY AND CARBURETTED WATER GAS.

A subject of general interest to gas managers and photometrists was debated at a recent meeting of the Gas Engineering Society, over which Mr. G. P. Lewis presides. The question considered was: Is there any reason to suppose that, with a mixture of carburetted water gas and coal gas, readings on the bar photometer are prejudicial to the quality of the gas? The opening of the discussion was undertaken by Mr. E. D. Weippert. His conclusion was that, in a strictly photometrical sense, the question must be answered in the negative; there was no reason to suppose that the readings were prejudicial. There was, however, a general impression that neither carburetted water gas alone, nor a mixture of it with coal gas, obtained justice on the photometer. Rich gas (say, of 25 or 30 candles) might suffer by the unsuitability of the burner, or by conditions which did not bring out its full value; but drawbacks such as these would have no existence with a mixture of coal and water gas of a little above 16-candle power. For the universal impression as to the gas not receiving justice, there was, he believed, a simple explanation. It was this: That when a 16-candle water gas was under test, the length of the flame from the argand burner was appreciably less than would be the case with coal gas of equal power. Consequently, the same amount of light was radiated from a smaller surface, which had the effect of dazzling the eyes of the observer, and impressing him with the idea that the gas had a high illuminating power. In comparisons of water gas and coal gas of equal quality, it was noticeable that the flame of the water gas appeared superior to that of the coal gas; but the latter lighted objects in the vicinity rather better than the former. This phenomenon he attributed to the difference between illuminating power and illuminating effect. In these remarks, Mr. Weippert wished it to be distinctly understood that he was referring to gases that were of corresponding value on the photometer; but if there was merely a small percentage of water gas present, the differences in appearance and effect would be so slight as to pass unnoticed. On the question of illuminating power and effect, he thought it would be agreed that a large amount of light emanating from a small surface gave a very bad effect; and it might be taken as generally true that the greater the surface from which a given quantity of light emanated, the greater would be the lighting effect. The extended surface could be obtained by employing burners designed to produce it, by consuming a larger quantity of a poorer gas, and by using a greater number of small candle-power burners. The effect produced increased with the number of separate points of light. Mr. Weippert summed up by saying that, compared with the photometrical readings, the illuminating effect of a water-gas flame was poor. In the discussion, the Chairman thought that, with the many special conditions and precautions necessary when water gas was being photometrically tested, some very strange results were likely to occur. Another speaker considered the stratification of water and coal gas might have something to do with the surprising results; and the Chairman further pointed out that the rapid changes in the specific gravity of the mixture rendered the jet photometer absolutely useless.

"Lunge on Coal Tar and Ammonia."—We have received from the publishers, Messrs. Gurney and Jackson, the third (enlarged) edition of the above-named work, which first appeared in 1882. We shall notice the book fully in an early issue.

"Garcke's Manual of Electrical Undertakings, 1900-1901."—We have received from the publisher, Mr. W. Alderson Smith, of Doulington House, Norfolk Street, W.C., a copy of the above-named work. This is the fifth year of issue; and the present volume extends to 1272 pages, as compared with 490 in 1896. Particulars and figures are given relating to upwards of 700 electrical undertakings owned by companies and municipalities, besides general information concerning upwards of 550 others.

A Tar-Oil Solution for Impregnating Wood.—For this purpose, a suitable solution, according to the "Revue des Produits Chimiques," is made as follows: In a machine with transverse motion mix some resin oil, either raw or purified, and cold as far as possible, with a like quantity of sulphuric acid containing a little anhydride. In liberating a small amount of sulphurous acid, the resin oil is dissolved in the sulphuric acid. Two layers are obtained—the lower one formed of dilute sulphuric acid, and the upper one containing nearly all the acids of the compound ethers, with a very little free sulphuric acid and the undissolved resin oils. All is then heated for some time, which causes again a separation of small amounts of acid. The top layer is neutralized by the aid of a moderately dilute soda or potash liquor, and water added so as to bring all to about 200 parts. The liquid, which is only slightly turbid through small quantites of separated substances, is mixed with an equal amount of tar oil, and water is added until the requisite degree of dilution of the injecting liquid is obtained. It is better to add to the acid of the free compound ethers an equal or greater amount of tar oil before neutralizing with an alkali. Then by adding limited quantities of water all the remaining free sulphuric acid is separated; thus preventing formation of alkaline sulphates and their noxious action on the tar-oil solution. Finally, neutralize and add the requisite amount of water. By tar oil, the inventor (Herr Rütgers) means the heavy coal-tar oil which is much employed for the treating of railway sleepers.

Increased-Pressure Gas Lighting of Southwark Bridge.—The process of converting public street-lamps to the improved higher-pressure systems of incandescent gas lighting is gathering speed as well as volume every day. Last week the whole of Southwark Bridge, in the City of London, was completely relit on Messrs. Sugg and Co.'s system. Hitherto the City of London Electric Lighting Company's arc lamps have been carried up the bridge approach, and the bridge itself has been lighted by parapet lamps, each containing a pair of tangent 5 cubic feet flat-flame gas-burners. These lanterns are disposed opposite to one another—some singly, others in twos, and on one pier in threes. They are now all fitted with 10-feet increased-pressure incandescent gas-burners, so that, without consuming any more gas, the lighting has been magnified from about 24 to 350 candle power per lamp, counting in the effect of the reflection from the inside of the lantern, which is darkened on the side towards the river. Moreover, the colour of the new light being practically the same as that of the arc lamps on the approach, the eye is not conscious of any break in the character of the lighting; except that, if anything, the gas lighting is more effective than the electric arcs, especially in dirty weather. By a striking coincidence, last Friday night, as a party of observers were trying in wind and rain to satisfy themselves as to which was the best lighting, all the electric lamps went out suddenly; thus leaving no room for doubt on the point. The increased-pressure gas-mains of this service, and all the connections, were laid as in the ordinary course by the South Metropolitan Gas Company; who thus mark their recognition of the permanent character of the new system of street lighting.

THEORY OF THE INCANDESCENT GAS-LIGHT.

By Dr. E. G. Love, of New York.

[A Lecture delivered before the American Gaslight Association, Oct. 18, 1900.]

The subject of incandescent gas lighting, especially in its more practical aspects, has become a very familiar topic at conventions of representatives of the gas industry; and it has also been very fully discussed in the technical journals. It is not my intention, therefore, to dwell upon the general features of the subject, but to confine my remarks more particularly to the theory of the light.

Up to the time that Welsbach demonstrated the possibility of obtaining from combustible gases a greatly increased luminosity, through the agency of the oxides of certain rare elements, the sources of these oxides were such rare minerals as allanite, gadolinite, xenotime, euxenite, zircon, monazite, and others which contain ceria, yttria, lanthana, erbia, and zirconia, and thorite containing thoria. The results obtained by Welsbach made it apparent that if the discovery was to prove of any practical value, it would be necessary to find a cheaper and more abundant supply of the oxides than could be furnished by the minerals just mentioned. The need has been more than met by the discovery of extensive deposits of monazite—especially of what is known as monazite sand, resulting from the disintegration of granotoid rocks. The most productive localities at present are North and South Carolina and Brazil. In the Carolinas, it occurs in the river beds and adjacent country; and in Brazil, in sand banks on the seashore. Besides the monazite, the sand also contains quartz, zircon, garnet rutile, and other minerals; but if it contains from 60 to 70 per cent. of monazite, it is considered of a very good quality.

It is a fact familiar to all that the first Welsbach burners which were put upon the market were in no way to be compared, either in the stability of the mantle, the colour of the light, or the efficiency in illuminating power, with those offered to the public to-day. In 1886-88 it was considered a satisfactory result to get 8 to 10 candles per cubic foot of carburetted water gas; while now 25 to 30 candles per cubic foot are readily obtained.

In the earlier forms of the Welsbach light, the mantles were impregnated with mixtures of zirconia and lanthana; the latter being sometimes replaced by yttria, erbia, or other rare oxide. The lanthana and zirconia give a white light; yttria, a yellowish white; erbia, a greenish; thoria, a bluish white; and ceria, a reddish. The various patents issued about that time covered a variety of oxides—the object evidently being to include everything which it was thought might be of advantage to the manufacture of the mantles, without any knowledge as to what combinations would give the greatest luminosity to the mantle.

The development of the incandescent gas-light has naturally been a purely experimental one; and it was only after several years of research that a mantle was made which showed any decided advance in the production of a high luminosity. Still later it was found that by far the best result was obtained from a mixture consisting of 99 per cent. of thoria and 1 per cent. of ceria; and this may be considered as representing the composition of the most efficient Welsbach mantles of to-day.

The chemical separation of the rare oxides in a state of purity is a matter of considerable difficulty; and it was found that an impure oxide would give a better result than a pure one. Thus a mantle containing commercial or impure thoria gave six times as much light as when pure thoria was employed. The reason for this is found in the fact that the impure oxide contained other oxides than thoria, in proportions more nearly approaching those artificial mixtures which experience subsequently showed gave greater efficiency.

In 1896, Fresenius and Hintz, after analyzing commercial thorium nitrate and also incandescent mantles, came to the conclusion either that the ceria was added directly to the impregnating solution or that a thorium nitrate containing more ceria than was to be found in the commercial nitrate was intentionally employed.

One of the interesting questions which have been raised more recently in connection with the incandescent gas-light is to account for the very high efficiency given by certain substances used in impregnating the mantle, and especially the thoria-ceria mantle. I should take too much of your time were I to discuss the various theories, physical and physico-chemical, which have been proposed. The names of Drossbach, Thiele, Le Chatelier and Boudouard, and others are familiar to many of you in connection with the purely physical theories of this phenomenon. It will answer our present purpose if I refer only to those physico-chemical theories which are now generally accepted as most satisfactorily explaining the production of the high illuminating power of the light.

In 1896, Dr. C. Killing published an article in the "Journal für Gasbeleuchtung," in which he proposed a theory to account for the luminosity of the thoria-ceria and other mantles.* He claimed that, in order to produce a maximum light from a thoria mantle, it must also contain another substance, and that such substance should be one having more than one degree of oxidation. Ceria answers this requirement; the metal cerium having two oxides, while thoria is the only oxide of thorium. It was Killing's theory that, in this case, the ceria acted catalytically, or as a carrier of oxygen, thus increasing the flame temperature.

I trust that I shall be pardoned for making a digression here in order to explain somewhat in detail what this so-called catalytic action is, since upon it depends an understanding of the theories we are discussing. Catalysis is a term introduced by Berzelius, and by him applied to the changes which sugar solutions undergo in the process of fermentation. The word catalytic is now conveniently applied to those substances which by their mere presence effect changes in other bodies, without themselves undergoing any apparent change. A familiar example of a catalytic substance is the binoxide of manganese. Chlorate of potassium is decomposed with the evolution of oxygen at about 700° Fahr.; but if some oxide of manganese be mixed with it, the oxygen is liberated at between 450° and 500° Fahr., and the oxide of manganese remains unchanged. In this case the action possibly consists in the oxide of manganese taking up oxygen from the chlorate of potassium, forming a higher oxide, which in time is decomposed into the lower oxide and free oxygen. There are other substances which act catalytically—not by alternate oxidation and reduction, as in the case of the oxide of manganese, but by a peculiar property they possess of condensing oxygen and other gases upon their surfaces, probably without the production of any chemical compound. Platinum is the best example of this latter class of catalytic bodies.

It is a well-known fact that oxygen and hydrogen, which under ordinary conditions require a temperature of 1200° Fahr. to effect their combination, will, in the presence of spongy platinum, combine without the application of any heat. Döbereiner discovered this fact nearly 80 years ago, and devised the well-known lamp which bears his name, in which a jet of hydrogen was ignited by contact with spongy platinum. The same use of platinum, in the form of platinum-black, is seen in many patent burners.

The explanation of this property of platinum is that the gases which are condensed upon its surface are brought into such close molecular contact that combination results. It seems very probable that the so-called catalytic substances do undergo a change of some kind in the process of catalysis; and it is, therefore, not strictly correct to speak of them as acting by their mere presence, although the catalytic may be found at the end of the action of the same nature as when it was introduced. Catalysis is, therefore, sometimes spoken of as a convenient fiction.

Dr. Killing supposed that, in the thoria-ceria mantle, the ceria acted as a catalytic, much in the same way as the oxide of manganese is supposed to act in the case cited—that it becomes alternately the higher and the lower oxide of cerium, and that the oxygen liberated in this process increases the flame-temperature and so the luminosity of the mantle. He also found that other bodies besides ceria are capable of exciting the thoria mantle. He states that one composed of 99·96 per cent. of thoria and 0·04 per cent. of platinum gives ten times as much light as one of pure thoria; and a still better result is obtained with thoria and iridium. Gold, osmium, palladium, rhodium, and ruthenium act in a similar manner; but not all bodies possessing this catalytic property are available for this purpose, as many of them are volatilized at the high temperature of the mantle.

Besides the rare oxides and the metals already mentioned, Killing tried the oxides of many of the baser metals—as chromium, iron, cobalt, nickel, and manganese—all of which were capable of performing the same function in the mantle as ceria, although none of them possesses the same degree of non-volatility as the ceria, nor develops the same high luminosity. That some of these are suitable for mantles is shown by the fact that the "Sunlight" mantle is composed of alumina, or alumina and zirconia, as a base, with oxide of chromium as the catalytic or oxygen carrier.

Acting on the theory of the catalytic property of ceria, it was suggested that a larger quantity of ceria might be added with advantage; but such did not prove to be the case. Thus Hintz has shown that a mantle containing 99·5 per cent. of thoria and 0·5 per cent. of ceria gives 11·6 candles per cubic foot of gas; and with 99 per cent. of thoria and 1 per cent. of ceria, the efficiency was 17·8 candles per cubic foot. But when the ceria was increased to 2 per cent., the light per cubic foot of gas fell to 15·3 candles; with 5 per cent. of ceria, to 10 candles; and with 10 per cent., only 2·7 candles per cubic foot of gas was obtained. Bunte explains this by saying that, on the ignition of the nitrate of cerium, a comparatively dense oxide is produced, which, in consequence, becomes a better conductor, and if employed in larger quantities diffuses the heat, instead of localizing it, as is the case when a small quantity of ceria is used. On the other hand, the nitrate of thorium on ignition intumesces in a remarkable manner—producing a very porous oxide, which is a poor conductor of heat. Moreover, according to the law of Dulong and Petit, the thoria should have a lower specific heat than the ceria, which is an additional advantage. The most favourable conditions, therefore, are a body of porous, non-conducting thoria, with just sufficient ceria as a catalytic to serve to raise the temperature of the flame to a high point.

Dr. Bunte, while ascribing catalytic properties to the ceria, takes a somewhat different view from Dr. Killing of the part which this oxide plays in the development of the light. He supposes that the ceria acts, not by a transference of oxygen, but that it possesses the property similar to the platinum, of condensing the gases upon its surface; and that the ceria, being spread over the surface of the non-conducting thoria, effects the

* An abstract of the paper referred to appeared in the "JOURNAL" for Dec. 8, 1896, p. 1128.

combination of the oxygen with the gases of the flame at innumerable points, developing intense incandescence. He has fortified this position by considerable experimental work; and his views regarding the action of the ceria in the mantle, together with other conclusions to which he has come, constitute what is known as the Bunte theory.

The views of Killing and Bunte have naturally met with considerable criticism, especially from those advocating a purely physical theory. It is evident that if the same high luminosity of the mantle could be obtained under conditions entirely removed from all combustion, it would be the end of the catalytic theory. Le Chatelier and Boudouard claim to have obtained as high luminosity when the mantle was heated in the hot products of the combustion of the flame as when placed in the burning gases themselves. Of course, if the combustion of the gases was complete, there would be no further opportunity for catalytic action. On this point Bunte reports some experiments made by Eitner, in which magnesia, thoria, ceria, and the thoria-ceria mixture were subjected to an intense heat by means of the electric current, without showing any difference in their light-emitting power. From this it may be inferred that, inasmuch as magnesia and the thoria-ceria mixture (which show such a great difference in luminosity in the bunsen flame) do not show such a difference when subjected to heat in which there is no combustion, it must be the combustion which is concerned in the production of the light from the thoria-ceria.

The researches of Döbereiner, Dulong and Thenard, and others years ago showed that platinum was not the only metal which lowered the ignition point of mixtures of oxygen and hydrogen, but that palladium, rhodium, iridium, osmium, gold, silver, cobalt, and nickel also possessed this property to a certain extent. Not only the metals, but certain non-metallic bodies—such as charcoal, powdered glass, porcelain, fluorspar, crystallized quartz, and pumice stone—were found to act similarly, but in a much less degree. They required a certain amount of heating before this property was manifested, but they never wanted heating to the ignition point of the mixture. Bunte has shown that ceria must be added to the list of non-metallic substances possessing this catalytic property. He found that when thoria did not possess the power of lowering the ignition point of a mixture of oxygen and hydrogen, the presence of ceria effected the combination of these gases at 660° Fahr. instead of at 1200°, which was required when the ceria was not present, or a reduction of 540°. It is probable that all solids have this property of condensing gases upon their surfaces to a greater or less extent; but it is in comparatively few cases that this condensation is sufficient to have any material effect in lowering the ignition point of the oxy-hydrogen mixture.

The "catalytic" theory, thus briefly stated, commands more recognition at the present time than any other which has been suggested; and whether we accept the views of Killing, or the more probable ones advanced by Bunte, relative to the action of the ceria in the mantle, the evidence is strongly in favour of one or the other as against any purely physical theory.

AMERICAN EXPERIENCE WITH INCLINED RETORTS.

By A. H. Barret, of Louisville, Kentucky.

[A Paper read before the American Gaslight Association, Oct. 17, 1900.]

The erection of an installation of inclined retorts having been determined on, the first question to decide was, "How large a plant should it be?" and then, "What units should be adopted?" To the first question, 2 million cubic feet daily was decided; and, to the second, units of 100,000 cubic feet—this latter being represented by benches of sixes with retorts 15 inches by 26 inches by 18 feet. This length retort, when set at the adopted angle, requires a bench 15 ft. 4 in. deep, face to face. It was further determined to build the plant in two stacks of ten benches each. The benches as arranged were to be 15 ft. 4 in. in width, with 22½-inch pier walls, and 3 ft. 6 in. end walls; the width of the arch being 8 feet. Upon these fixed determinations the house was planned as follows.

The retorts were to be so arranged as to discharge toward the outside walls; this being, in my judgment, the most desirable arrangement. A space of 25 feet between the benches was allowed for the middle gallery or charging floor; this space being required for placing the two lines of coal-hoppers overhead, as well as the two stacks, and allowing for proper ventilation. This floor is 27 ft. 9¼ in. from the ground-level. The outside or discharging floor was made 13 ft. 10 in. from the face of the bench to the house wall, and 13 feet from the ground-level. A space of 11 ft. 3 in. was allowed at each end of the stacks for passage, stairways, &c. These requirements called for a house having a length of 128 ft. 4½ in., and a width of 85 ft. 4 in.

Circumstances requiring that great economy be exercised as to the cost of building, it was determined to build the house of skeleton steel construction, and fill it with fire-proofing of 12-inch thickness; and 7-inch channels were used on the side and walls for both verticals and horizontals, with the addition of a few members of greater depth as stiffeners.

The roof is carried on the front and buckstays, which in the former case consist of two 15-inch channels, and in the latter case a box-column of channels 15 inches in depth. These latter buckstays are made heavy, as they must serve as columns as well, not only to carry the main roof superstructure, but the coal-bins and gas-engines for working the conveyor, and the conveyor itself.

Above the coal-bins and conveyor is a ventilator, fitted with louvres running the entire length of the house. In the roof over the stand-pipe are suitable doors, which may be raised, and through which rods or augers can be passed when cleaning may be needful. This arrangement was necessary by reason of lack of headroom otherwise for this work.

The coal-bins are in two rows—one next each stack, and 9 ft. 10 in. wide, 11 ft. 6 in. deep—running the entire length of the benches, and carrying sufficient coal to last 48 hours, represented by 280 tons. The coal-bins, &c., as mentioned, are carried on 30-inch girders, riveted to the top of the buckstays. The house stands 39 ft. 1¾ in. under the eaves, and 71 ft. 6 in. to the comb of the ventilator.

The angle of 32° was adopted as being the most desirable, from the fact of my having seen good work on this slope, as also the fact that I believed I could purchase, with general regularity, a grade of coal suitable to this condition.

The dimensions of each stack, as already indicated, are 103 ft. 10⅜ in. long, 15 ft. 4 in. wide, with a height of 27 ft. 9 in. at the discharge side, and 35 ft. 6 in. at the charging side. The retorts are fitted with mouthpieces having the same angle as retorts with vertical faces. The lower mouthpieces have screw-cotter, and the upper or charging doors have cam-cotter. The lower mouthpieces average 16 inches deep, and are so made that they increase in depth from the bottom up, to allow the drippings of tar to fall free. The upper mouthpieces are 17 inches deep. The lower mouthpieces have 7-inch stand-pipes. Each bench has a separate main and take-off pipe—the latter 8 inches in diameter.

The hydraulic mains are carried over the lower or discharge end of the bench on channels, which are further used as tie-rods between the front and back buckstays. The height of the main from the discharging floor is 30 ft. 2 in.; leaving a clear space of 7 feet between the bottom of the main and the top of the bench, for ventilation. A suitable gallery is arranged for reaching the hydraulic main, as also another on the outside of the bench for reaching the stand-pipes.

The hydraulic main has some novel features to which I desire to call your attention. My own experience with removing the pitch or heavy tar from the ordinary main in the usual manner and maintaining the integrity of the seal, has been far from satisfactory. This main is arranged in two compartments; the upper part (or main proper) into which the dip-pipes run, having the usual dip regulator, and the lower (or tar receptacle) having the tar-outlet. When the main is in normal working and full of water, the 8-inch cone-valve which connects the two chambers is allowed to stay at the bottom of the tar-chamber. The bottom of the main proper being sloping, any heavy tar (or, for that matter, any tar at all) readily runs down into the lower chamber, displacing its equal bulk of water or lighter tar and oils, or forcing them into the upper chamber to maintain the seal or overflow through the usual dip regulator, as the level of liquor may demand. Now, periodically—which is controlled by local conditions—the tar-valve is raised and held in its seat; and a small air-cock connecting into the tar or lower chamber is opened, and the tar-valve outlet on the bottom of the lower or tar chamber is opened, allowing the air to flow in and the tar to flow out into the usual tar-trough. When the tar-chamber is empty, the tar-valve is closed and a water-valve opened, and water is allowed to flow in until it is full. Its being full is indicated by the overflowing of the air-cock, when both air and water are shut off, and the tar-valve lowered into its normal position at the bottom of the tar-chamber, ready for its next charge of tar. By this method of operation, the seal of the dip-pipe is in no way disturbed, and the main is thoroughly freed from heavy tar. The capacity of the tar-chamber is about 60 gallons. Suitable hand-hole plates are arranged for periodical inspection. The mains are connected by an 8-inch take-off pipe, before mentioned, to a 16-inch main running around the entire house under the eaves.

Going back now to the bench construction. The furnaces are set well under the benches, and the coke-shoot projects 3 ft. 10 in. in front of the face of the bench. This was so arranged to produce a more even bed of fuel in charging, and to make the entire fire surface accessible from the top for breaking-down clinker—thereby facilitating and expediting the work of clinkering. The grate surface of 4 ft. by 2 ft. 3 in., gives 9 square feet of surface, not including the stop grates.

The recuperators have horizontal flues, and are provided with iron stoppers at each level. The waste-gas flues from each side (two at the front and two at the rear of the bench) are carried to a common flue under the centre of the bench below the ash-pan, and from there to the main flue, extending the full length of the stack outside the wall of the bench foundation, and from there to the stack, which is centrally located—there being one stack for each stack of benches. These stacks are of iron lined with brick, and are 4 feet in diameter and 32 ft. 6 in. high from the bottom of the main flue. This stack gives ample draught with ten benches going and the flue dampers more than two-thirds closed. The primary and secondary air supplies have dampers at both front and back of the benches.

The coal-hoppers are provided with suitable gates at the centre of each bench. Below this, running on a tramway suspended from the buckstays on one side and the beam carrying

the coal-bins on the other, is the measuring and charging shoot, combined in one. The shoots are so arranged as to be adjustable as to the weight of the charge; and each elevation of retorts has its own fixed charger or shoot. The shoots are combined in units of threes; so that they may be filled and discharged into a vertical line of three retorts. No baffle-plates or regulating device other than the main valve are used. The actual time of placing a charge of 650 lbs., from the time of opening the valves until all the coal is in the retort, is 10 seconds.

On the lower or discharging floor two shoots are used—one for passing the coke through suitable openings in the floor to the coke-waggons, and the other for diverting the coke to the furnaces. For the comfort of the men, it is necessary that these floor-openings should be of ample size, as the coke frequently rushes out, when the fender is removed, in great quantities. With an ordinarily well-burned charge, it takes 15 seconds from the time the stopper is removed until all the coke is out. As a rule, the retort will not empty itself. It requires a little assistance, both from the man on the lower end to break the gorges, and by the charging man to start it from the upper end. How much this labour is, you may judge from the amount of work done by each gang, which I will give later on.

The coal as it comes from the contractor or storage sheds is delivered to a conveyor, which carries it up to a hopper, from which it is distributed to the screens, of which there are two, the first or top screen having a 4-inch mesh, and the second, ¾-inch and 1-inch mesh. From the top screen all lumps over 4 inches are delivered to the first crusher (of which there are two), where it is reduced to about 4-inch grade. The balance falls to the second screen, where everything above ¾ inch or 1 inch is sent to the second crusher, where, together with that coming from the first crusher, it is reduced to about ¾ inch. This then drops into a trough, where it joins the portion which had passed the second screen, and then into the boot of the elevator. From here it is elevated into the second conveyor, some 73 feet above the ground, where it is carried across the street and over an old retort-house to the new retort-house. Up to this point we have but a single conveyor. Just inside the house, the coal is emptied into a hopper, having suitable valves, by which it is diverted to other conveyors, running over each line of coal-bins. The conveyor troughs have suitable doors, permitting the coal to be deposited at any point desired. The conveying, crushing, and elevating machinery at the receiving end is operated by a steam-engine. The conveyors to and through the retort-house are operated by gas-engines, located between the bins at the extreme end.

The coke as it comes from the retorts is dropped into waggons, running on rails. These waggons, having a capacity of 60 bushels, are provided with spraying pipes, placed around the inside of the upper edges and on the bottom of the waggon. The sole object of these sprays is to protect the ironwork. When the cars are filled and ready to be moved, they are shoved to one of the four corners of the building, and placed under hoods located there—having a ventilating pipe, 30 inches in diameter, extending through the roof—where the coke is completely quenched, and the smoke and steam carried out of the building. These shafts also materially aid in carrying off the smoke, &c., incident to the discharging of the retorts.

After complete wetting, the coke is carried to a hydraulic elevator, where it is raised to the top of the bins and distributed by suitable tracks and switches. The coke-bin proper is 90 feet long, 30 feet wide, and 50 feet high, and is capable of containing 22,950 bushels of lump, 11,473 bushels of egg, 5736 bushels of nut, 5736 bushels of pea, and 5736 bushels of breeze. As the lump coke is taken from the bins, it is automatically screened in passing over the shoots, which have 1½-inch holes in their bottoms, through which the small coke and breeze pass to pockets. From the pockets the residual is taken by tram car to a bucket elevator, and carried again to the top of the bins, where it is assorted by proper screens into the sizes above mentioned. So that, from the time the coal is placed in the first conveyor until it is loaded into the waggons as coke for distribution, it has not to be touched by hand.

The first two benches were charged on Aug. 9, and were quickly followed by others until one entire stack of ten benches was in operation in five-hour charges, burning off 650 lb. charges. The old retort-house was discontinued on Sept. 7. The charges are satisfactorily and evenly placed, and are easily within the control of any fairly intelligent labouring man. The only trouble experienced by me has been when the coal was too fine—that is, contained too much slack or dust—when it seems to drag and pile in the upper end of the retort. It must then be assisted by pushing with a hand rake. There also appears to be considerable tendency to crowd or slip with this grade of coal. Using mine run coal, I have had serious trouble from this on not more than three or four occasions. It is essential to satisfactory working that the coal be as nearly of uniform quality as possible.

The labour as now being worked is as follows: The gangs are of four men each, two for charging and two for discharging. These men draw and charge nine retorts per hour in 22 minutes average working; and I am expecting with cooler weather this gang may be able to draw and charge twelve retorts. By far the greater part of the time is occupied in filling furnaces, cleaning mouthpieces, and placing fenders, as the actual time of discharging is only about 2½ minutes, based on the statement of actual time of discharge previously given. The time of charging is not to be considered, as the delay occurs at the discharging end. Figuring on 650 lbs. and five-hour charges, this would give 8·8 tons per man per day on the retort-house floor for nine retorts, or 11·7 tons per man per day for twelve retorts.

The yield and candle power are about what you could expect from this grade of coal under any ordinary working conditions. In this short time of working, I am unable to state positively as to the coke, tar, and ammonia; but from evidence up to this time, I shall expect the yield of tar to be materially decreased.

Many little peculiarities have developed which, when worked out and understood, can be easily controlled. One thing is, however, certain—that the coal can be accurately and certainly placed and burned to any degree desired. I have so far been very slow about pushing the benches up to what I believe them capable of doing; being satisfied to go slowly and learn any peculiarities that may develop.

REGISTER OF PATENTS.

APPLICATIONS FOR LETTERS PATENT.

2888A to 2888F.—Naef, P., "Producing gas and bye-products." Nov. 9.
2917A to 2917D.—Naef, P., "Producing coke, gas, and bye-products." Nov 10.
19,783.—Crowther, A., "Preventing vibration in incandescent gas-burners." Nov. 5.
19,794.—Robinson, J. W., and Corsham, R., "Incandescent lamps." Nov. 5.
19,848.—Kitson, A., "Oil-vaporizing apparatus." Nov. 5.
19,853.—Csáky, S., Sárkány, J., and Centiàn, S., "Acetylene gas-generator." Nov. 5.
19,859.—Meyer, G., "Incandescent bodies for lighting purposes." Nov. 5.
19,895.—Dawson, S. & J., and Lewis, W. W., "Acetylene generator." Nov. 6.
19,908.—Scott Snell, C., "Lanterns for illuminating purposes." Nov. 6.
19,938.—Salomon, J. M. J., "Engines driven by a mixture of air with gas." Nov. 6.
19,955.—Delaloye, L., "Producing a mixture of acetylene and atmospheric air for lighting." Nov. 6.
19,980.—Bennis, E. & A. W., "Furnaces or retorts in which a heated solid product or refuse has to be removed." Nov. 6.
20,073.—Smith, G. G., "Purifying acetylene and other gases." Nov. 8.
20,080.—Ward, E., "Incandescent gas-burners." Nov. 8.
20,143.—Boult, A. J., "Gas-lamps." A communication from K. M. Seifert and Co. Nov. 8.
20,149. Genty, L., "Internal combustion engines." Nov. 8.
20,168.—Richards, E. J. W., and Marshall, R., "Gas reversing valve." Nov. 9.
20,229.—Shepherd, H., "Acetylene gas-generators." Nov. 10.
20,239.—Keith, J., "Apparatus for heating and ventilating." Nov. 10.
20,249.—Campbell, J. G., and Sillars, A. T., "Acetylene gas-producer." Nov. 10.
20,261.—Potter, W. G., "Gas-governors." Nov. 10.
20,275.—Werthen, M., "Incandescence gas-burners." Nov. 10.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, Nov. 13.

(*Before the* Master of the Rolls *and Lords Justices* Collins *and* Stirling.)

Welsbach Incandescent Gas-Light Company, Limited, v. United Chemical Works.

This was an appeal by the defendants from an order of Mr. Justice Day, in Chambers, on the 3rd inst., granting an injunction against them, preventing infringement of plaintiffs' patent of 1893, and also restraining the issue of an advertisement they had published.

Mr. Astbury, Q.C., and Mr. Neill appeared for the appellants.

When the Court sat, shortly after half-past ten, there was no one present on behalf of the respondents; the printed list stating that the Court would sit at eleven o'clock, which the Master of the Rolls said was a blunder.

Mr. Astbury said he understood that Mr. Moulton, Q.C., Mr. Bousfield, Q.C., Mr. T. Terrell, Q.C., and Mr. Walter were briefed for the other side, and he could open the appeal and send for respondents' Counsel.

Mr. Terrell and Mr. Walter shortly afterwards appeared.

Mr. Astbury stated the facts as to the action commenced in August in the Chancery Division, in which Mr. Justice Farwell declined to grant an interlocutory injunction in the Vacation, after which the proceedings were discontinued and the present suit commenced.

Mr. Terrell and Mr. Walter supported the order, on the ground that irreparable damage might be done to the plaintiffs if the defendants were allowed to go on trading.

In the result, their Lordships decided that the injunction ought not to have been granted; and they allowed the appeal, with costs both in this Court and the Court below.

WESTMINSTER POLICE COURT—Thursday, Nov. 15.

(*Before Mr.* Sheil.)

Alleged Impurity of the Gaslight and Coke Company's Gas.

This was a prosecution instituted by the London County Council against the Gaslight and Coke Company for supplying impure gas on

the 14th of July; the impurity being an alleged excess of sulphuretted hydrogen. The circumstances had been investigated on the 16th ult., according to the ordinary course, by Dr. A. W. Williamson, the Chief Gas Examiner, whose report had been issued, and who, it was contended, had disallowed the appeal of the Gas Company.

Mr. J. W. Godfrey appeared for the Council; Mr. Horace Avory represented the Company.

Mr. Avory contended that there was really no report showing an excess of impurity in this case, but that the one issued was worthless inasmuch as, though it set forth that certain witnesses had been examined, who stated there was a faint discoloration of the test-paper, and evidence had been given the other way, it was not said that the Chief Gas Examiner believed either one side or the other. Though the report stated that the Metropolitan Gas Referees had ruled that distinct discoloration of the surface of the test-paper was to be conclusive evidence that sulphuretted hydrogen was present, the learned Examiner had not found, as a fact, that there was such discoloration, but had only reported that various competent witnesses present at the hearing stated that a faint discoloration of the test-paper was visible. Mr. Avory further stated that the Chief Gas Examiner was over eighty years of age, and that, his eyesight being defective, he could not himself see whether or not the paper was discoloured, and had appealed to someone present to look at it for him.

Mr. Godfrey: I submit that you cannot go behind the report. You must take proceedings to quash it.

Mr. Avory: The gentleman who is invested with the powers cannot see the difference between a pin-hole and a black spot. Besides, the report is no decision at all. The Examiner only says that "the Gas Referees have found" so-and-so. He does not anywhere say that he finds as a fact that there is any distinct discoloration of the test-paper. He speaks of the opinion only of numerous competent witnesses.

Mr. Sheil said he agreed that it was a most remarkable report.

Mr. Avory: He gives his reasons without giving his decision.

Mr. Godfrey: It is entirely a matter for him. He is the judge; and the County Council cannot interfere with the terms of the report.

Mr. Avory: This old gentleman, from age, is incompetent to perform the duties of his office.

Mr. Sheil: He is not very competent to draw a report. Mr. Avory is getting out of the case by a technicality; but I cannot help that. The summons is dismissed.

Mr. Avory asked for costs.

Mr. Sheil: Oh, no! You are only honourably acquitted through a flaw in the indictment.

The Liability of Traction-Engine Proprietors.

At the November sitting of the Deal County Court, before his Honour Judge Sir Lucius Selfe, the Walmer Urban District Council claimed £2 from Mr. A. Baldock for expenses connected with the repair of a water-main in Grove Street, Walmer. Mr. John F. Cullen, the Water Engineer and Surveyor to the Council, stated that the main was fractured by a traction-engine driven over the road by the defendant; the wheels having made an indentation of 3 or 4 inches over the spot where the pipe was laid. The road was made up with shingle, as it was not much used. The pipe was a 7-16ths inch cast-iron one, and was laid at a depth of about 15 inches, which had been sufficient for ordinary traffic for the past thirty years. He had relaid it at 2 feet. The pipes now used were large, and were laid deeper. Witness cited cases in which it had been decided that owners of traction-engines were liable for damage caused to gas and water mains by their engines, and that it was not necessary to prove that the road was of sufficient strength to sustain traction-engine traffic in order to fix the liability. Defendant denied that his engine went over the spot where the main was laid, and suggested that the pipe broke in consequence of rust. He had to pay heavily for his license to travel on the roads. His Honour said the law seemed to him to have been settled by a higher authority than those cited—viz., the Court of Appeal—who had held that a vestry was liable for damage to gas and water pipes by steam-rollers used in repairing the roads, if such pipes were laid at a sufficient depth to sustain ordinary traffic. From the evidence before him, he concluded that the main had been properly laid at a depth to resist ordinary traffic, but not that caused by traction-engines on a road of the kind in question. The defendant stated, first, that his engine did not break the pipe. This was a question of fact which he (his Honour) should decide against him. Secondly, he said he was licensed to use his engine on the road. The Acts of Parliament regulating the employment of locomotives on roads expressly fixed the liability of a person using a traction-engine for damage or injury caused, not merely by negligence, but by nuisance. The question was whether the engine in the present case was so used as to be a nuisance. The pipe was laid in a road not made up for such traffic, and was broken by defendant using a traction-engine on it. He was therefore liable for damages. Judgment was given for plaintiffs.

The Employment of Lads in Gas-Works.

At the Wolverhampton Police Court, last Friday, the Wolverhampton Gas Company were fined 10s. and costs in three cases under the Factory and Workshops Act, where three lads under 16 years of age were employed more than seven days without a medical certificate of fitness having been obtained. It was stated that the lads had worked for the Company for twelve months.

Wells Water-Works Purchase.—A meeting of the ratepayers of Wells was held yesterday week, for the purpose of giving them an opportunity of expressing their approbation or otherwise on the question of the City Council acquiring the water-works. The Mayor (Mr. E. A. Crosse) stated that the promises of the Company to give a better supply had not been carried out; and the inhabitants and the Medical Officer complained of the present condition of affairs. The Company had no further borrowing powers according to their Act; and therefore they were unable to expend the large sum necessary for improvements. A resolution was passed consenting to the promotion of a Bill for the acquisition of the works, and to make better provision in regard to the supply of the district. A poll, however, was demanded.

MISCELLANEOUS NEWS.

PROJECTED METROPOLITAN GAS LEGISLATION.

Additional Capital and other Powers for the Gaslight and Coke Company—The South Metropolitan Company and the Nine Elms Works.

The Gaslight and Coke Company published last Friday the usual "Gazette" notice of their intention to apply to Parliament next session for power to raise further share and loan capital by the creation and issue of ordinary, preference, and debenture stock, "rateably and in such proportions the one to the other as may be prescribed in the Bill." It is intended to make new and special provisions with respect to the dividends to be paid by the Company upon the ordinary stock to be created and issued, and for these purposes to declare and define, but as applicable only to this stock, a standard price of gas and a standard rate of dividend, such rate to increase or decrease with the decrease or increase in the price charged for gas. For the purpose of calculating the rate of dividend to be paid, "the price from time to time charged by the Company in their district south of the River Thames shall not be deemed to be the price of gas for the time being." Provisions are to be made with respect to the Company's insurance and reserve funds; and they are to be authorized and empowered—or, if deemed expedient, required—to create and provide "a redemption fund to be used and applied by the Company for the purpose of effecting a reduction in the aggregate amount of the capital of the Company entitled to dividend, or for such other purposes as Parliament may prescribe." The remaining powers to be applied for relate to the acquisition of land in the parish of East Ham, on which to construct works for the manufacture of gas and the conversion of residuals.

The South Metropolitan Gas Company have given notice of their intention to apply again to Parliament for powers to purchase from the Gaslight and Coke Company the portion of the undertaking of that Company situated on the south side of the Thames, for such price or consideration, and generally upon such terms and conditions, as may be agreed upon. The Bill will provide for the extension of the southern Company's limits so as to include the acquired area, and also for the appropriation and application of the price or consideration paid for the transfer. It will likewise empower the Companies to enter into and fulfil agreements for and in relation to the transfer, and confirm, with or without alteration, any agreements which may have been or which, during the progress of the Bill, may be entered into touching the matters above referred to. The Company will ask for authority to apply to the purposes of the Bill their existing funds, and any moneys they are still authorized to raise, and for the purchase of the district and works in question, and for the general purposes of their undertaking, to raise additional capital by the creation and issue of new ordinary stock, and by borrowing, and by the creation and issue of debenture stock. The Bill will extinguish all such rights and privileges as would interfere with any of its objects, confer others, and repeal, alter, and amend, and if thought fit consolidate all such provisions as may be deemed necessary or expedient in several local and personal Acts.

WEST BROMWICH CORPORATION GAS SUPPLY.

The Price of Gas for Motive Power.

In a paragraph which appeared in the last number of the "Journal" (p. 1232), we briefly recorded the result of a discussion which took place in the West Bromwich Town Council on the 7th inst. on a resolution of the Gas Committee to amend the existing scale of charges for gas by making the rate for all consumers of a million cubic feet, and upwards per quarter, for motive power purposes, 1s. 9d. per 1000 feet, as from the commencement of the current quarter. It may be remembered that the Committee's decision was approved by the Council by 16 votes to 6; but it was not until there had been a good deal of talk on the subject, which we could not notice last week. The first discordant note was sounded, curiously enough, at the very outset; for Mr. Bushell, the Chairman of the Committee, who moved the adoption of their report, candidly confessed that he was unable to agree with the recommendation. He reminded the Council that a short time ago, in consequence of the rise in the price of coal, the Committee were compelled to make an advance in the scheduled prices, and though the average was more moderate than in neighbouring towns, there was a considerable increase to the largest consumers—from 1s. 6d. to 2s. per 1000 cubic feet. Though there was only one consumer taking advantage of the lower rate, there was another coming on towards the amount at which he would be qualified for it. If the resolution was carried, he argued that the Council would be setting a very bad example by selling one of their products at materially less than cost price. So greatly was it below its cost that, if carried to a logical conclusion, and all the consumers were supplied at this rate, he believed it would mean the ruin of the undertaking. The average cost of gas in the borough was about 2s. 2d. net per 1000 cubic feet; but if the resolution was approved, they would be selling it at 1s. 8d. net to these particular consumers. No argument about day and night load, surplus gas, or anything else, could alter these facts; and he wished to disclaim any responsibility for the resolution which he had formally moved. Mr. Wilson, in seconding the motion, expressed surprise and regret that the Chairman of the Committee should have raised this question in the Council. It had been thrashed out in Committee; and it was, to his mind, a very simple matter. Last year the gas in the holders did not cost them 1s. per 1000 cubic feet. After providing for interest and the sinking fund, it would, he contended, pay the Committee to supply gas at 1s. 9d., simply because it was produced when the plant would otherwise be idle. Even with the advance in the price of coal, the gas in the holder did not cost 1s. 2d. per 1000 cubic feet; so that they had 7d. to the good. Their plant was very valuable and expensive; and if they could get 7d. per 1000 cubic feet by supplying gas when it would otherwise be idle, they were right in doing so. If they did not so utilize their plant, the result at the end of the year would be very much worse than it was. Mr. Bushell argued that, on Mr. Wilson's own showing, it could not be 7d. Mr. Wilson replied that he would take it as 6d.; but this would not alter his argument. He considered it was better

to get this than to let the works stand idle. They would by so doing encourage local industries, and induce local manufacturers to put down gas-engines, which would be in the interests of the Corporation. He considered that they behaved most unfairly to the motive power consumers when they raised the price; and he did not think the large increase which was then made was warranted. He concluded by expressing the hope that the Council would stand by the Committee.

The discussion having been fairly opened by these two speeches, other members of the Council proceeded to express their views on the subject. The first speaker was Mr. Brockhouse, who thought there was a good deal of sense in what Mr. Wilson had said. Mr. Turley inquired whether 3d. per 1000 cubic feet was not a sufficient increase on the old price to meet the rise in the cost of coal. They ought to keep faith with those who had put down gas-engines, and do what they could to encourage them. Mr. W. Lawley thought it would have been better in the first instance to have made the increase a uniform 3d. per 1000 all round. Mr. Peters said as the day consumption was so much to the good, he should support the resolution. Alderman Blades thought that, while the larger consumers were entitled to consideration because it was less expense to collect the accounts, it was a dangerous principle that they should sell gas below its cost to the large consumers. Mr. Price said it would seem that they were to supply gas at the cost price and add nothing for the wear and tear. Alderman Salter remarked that when they altered the prices they raised them 2d. per 1000 cubic feet only to the ordinary consumer, but over 33 per cent. to the consumer for power purposes. Before long the Electric Light Committee would be going round, hat in hand, asking manufacturers to adopt the light; but if the latter had not confidence in the rates being adhered to, he did not think they would find many prepared to run the risk. They did not object to a fair increase, but they did to such a one as was recently made. The Mayor (Alderman Pitt) reminded the Council that in what they were doing that day they were not rescinding anything, but simply making a new figure. The difference between the Chairman of the Committee and themselves was not much—it was £12 10s. Mr. Bushell here chimed in by asking: "Multiplied by how many times?" The Mayor resented the interruption, and said the difference between them was £12 10s. per million cubic feet. He thought if they could keep the men employed during the day, get something for the interest and sinking fund, and benefit the trade and the town, they were doing the right thing. Mr. Newman said it was wrong to induce people to put in gas-engines and then increase the price; but if the Corporation could not make the gas at the price they fixed, they ought not to sell it at that price.

The last speaker brought the discussion to a close, and Mr. Bushell replied. He said he had nothing but the public interest at heart, and if the Council relieved him from the responsibility of a policy he did not believe in, he had done all he could when he made his protest, and must accept the verdict. But he hoped a majority of the Council would show their disapproval of a system which was commercially unsound—a juggling and turning things inside out and subverting them from their proper course. Their gas cost them 2s. 2d. per 1000 cubic feet; and whether they made more or less was not a material fact in the argument. The ordinary charges were fixed; and it was only the day charges they had to take into consideration in judging this proposal. Their coal cost them 18s. 6d. per ton, but to these large consumers of gas they would be practically selling it at 9s. 6d. per ton. They would be selling the gas, he repeated, at 6d. per 1000 feet less than cost price. These were facts that could not be gainsaid. He would not believe, until the vote was taken, that the Council would give effect to a principle that was so rotten. As to the charge of breaking faith with the large consumers, it really could not be upheld. They had no contract with them, and when they had not sufficient faith in the Council as a whole to do to the best of its knowledge justice between one and another, the public life of West Bromwich would have fallen to a low ebb. The vote was then taken, with the result already recorded.

THE PROPOSED MUNICIPALIZATION OF THE HARTLEPOOL GAS AND WATER WORKS.

A Special Meeting of the West Hartlepool Town Council was held on Monday last week to receive the report of the Committee who recently, in conjunction with a Committee of the Hartlepool Corporation, had under consideration the advisability of the two Corporations jointly applying for powers to purchase the undertaking of the Hartlepool Gas and Water Company. The report was discussed in private; and upon the Press being admitted, the Mayor intimated that the Joint Committee, after going thoroughly into the question, had recommended the adoption of the following resolution: "That this Council adopt the recommendation of the Joint Committee, and recommend that, in conjunction with the Corporation of Hartlepool, a Bill be promoted in Parliament for the joint purchase of the undertaking of the Hartlepool Gas and Water Company, and that the purchase price be based upon the rateable value of the two boroughs, that the promotion expenses be paid in that proportion, and that the Hartlepool Corporation be informed of the conclusion come to." Dealing with the matter of cost, he said that it would be quite impossible to fix absolutely the purchase price of such a lucrative undertaking until every inquiry had been made. The Committee had been absolutely unanimous in the decision they had come to. They had been largely guided in their conclusion by the evidence that had been afforded them of what had occurred in other towns where several similar undertakings had been transferred. In none of these cases had the ratepayers had occasion to regret the transfer. Either at once or after a year or two, there had been a balance on the right side of the revenue account, and soon after a balance in relief of the rates. The evidence of other towns in this respect had been so overwhelming that several members of the Council who had been sceptical had agreed with the Joint Committee's finding. He went on to point out that, in nearly every case in which arbitration for compulsory purchase had been resorted to, the result had been very much more favourable to the corporations than had even been anticipated by them. The Company had been approached, and were not willing to sell; but it was hoped that the unanimity shown by the two Corporations would have such an effect upon the minds of the Directors that they would be spared anything in the nature of a long contest. The recommendations were unanimously carried.

THE EDUCATIONAL FUND OF THE AMERICAN GASLIGHT ASSOCIATION.

As a supplement to the paper by Mr. Forstall, read at the recent International Gas Congress in Paris (*ante*, p. 707), some extracts may be given from the report of the Trustees of the Educational Fund of the American Gaslight Association to the recent meeting at Denver.

The Committee—under the chairmanship of Mr. Walton Clark, with Mr. Alfred E. Forstall as Secretary—stated that the educational work had been continued along the lines laid down in their last annual report. The advanced section of the Correspondence Class having finished three years' work, the 19 members of the section severed their connection with the class on Jan. 1 last. Many of these students entered the class when the work was first begun in 1896. Upon learning of the decision of the Trustees to limit the length of the course of study to three years, they "almost without exception wrote expressing regret at having to retire from the class, and thanking those who had given them the opportunity to increase so greatly their knowledge of the business in which they are engaged." As the same feeling of gratitude was expressed in letters of resignation received from members of the class who were unable, from force of circumstances, to keep up the work, the Committee felt that their efforts had not been entirely in vain. The second section of the class had a membership on Oct. 1, 1899, of 81, which had been reduced by death, resignations, and failures to answer the questions to the present number of 42. At the same time that the advanced section was dismissed, a new section (called the third section) was formed with a membership of 79. The net loss by resignation and failure to answer the questions had been 26; and the membership of this section was now 53.

The present number of subscribers is 94. Deeming it wise to lay aside as much as possible for the carrying on of the work, in case all the present subscriptions should not be renewed at the end of the five years for which they were made, the Trustees decided to set aside the surplus left over—after paying the expenses incurred during the first fiscal year—and all interest on investments, to form a nucleus for a permanent fund.

Realizing and appreciating the value of the services rendered by Mr. Alex. C. Humphreys in connection with the work of the Trustees, and being unwilling to suffer the loss of these services at the end of his term of office as an *ex-officio* Trustee, his fellow members of the Board increased the number of its permanent members from three to four, and elected Mr. Humphreys a permanent Trustee.

THE SEQUEL TO THE FATAL GAS EXPLOSION IN BOSTON (U.S.A.).

Damages Against the Gas Company.

Our readers will doubtless remember that early in the year 1897, we reported a serious explosion of gas which had occurred in Boston (U.S.A.), resulting in six deaths, and injuries to about forty people. It took place just before midday on the 4th of March, in a subway at the corner of Tremont and Boylston Streets, into which gas from the mains of the Boston Gas Company had leaked. The accumulated explosive mixture was ignited either by a spark from a tramcar which was passing, or by a temporary arc formed by an imperfect connection in the return circuit of the electric cable under the tracks. Two cars were at the curve of the road at the time; and both were badly damaged. The whole width of Tremont Street was thrown up at its juncture with Boylston Street; and several holes were made in the pavement some hundreds of yards away. Altogether, three street cars, a *coupé*, and a public carriage were burnt; and, worse than all, as stated above, lives were sacrificed and bodily injuries sustained. One of the victims was the Rev. W. A. Start, a Professor at Tufts College; and, in accordance with the Public Statutes of the Commonwealth, an inquiry was instituted into the cause and manner of his death. It was conducted by Judge Ely, and lasted from the 12th of March till the 2nd of April. On the 22nd of that month he issued his report, the principal points in which were given in the "JOURNAL" for the 25th of May. He found that the explosion had been caused by the negligence of the Gas Company, that this negligence was "gross and inexcusable," and that the death which was the special subject of his investigation "resulted from the unlawful act" of the Company. This decision fixed the responsibility.

The matter then came into the Courts on a test case; the plaintiff being one Wolf Koplan, a young bootblack, who was standing near the scene of the explosion when it happened. He was thrown to the ground and slightly injured. An action was brought on his behalf to recover $10,000 damages; and, after a trial extending over six weeks, he was awarded $3000 against the Gas Company. There were several other Companies concerned in the matter—the Bay State Gas Company, the Boston Electric Light Company, the Edison Electric Light Company, the Metropolitan Construction Company, and the West-End Street Railway Company; but, before the trial, proceedings were withdrawn against the first two. At the trial, when the evidence for the defence was closed, the Court ordered a verdict to be given in favour of the Edison Company. The proceedings against the other defendants, however, went on, though the Counsel for the Construction Company practically took no part in them, except to adduce a final argument when the time came for doing so. Verdicts were eventually returned for that Company and the Railway Company; and this left the issue between the plaintiff and the Gas Company solely. The latter made a strenuous effort to show that the gas which caused the explosion was not theirs, but some which had been generated from a composition kept in the junction-boxes of the Edison Company. They further contended that, even if it should be found by the Jury that it was their gas which brought about the catastrophe, they were not liable, inasmuch as they had not been negligent in looking after their pipes. Experts were called by both sides on different lines of evidence; considerable testimony being offered with respect to the effect of electrolysis on the gas-pipes. The plaintiff sought to show that this produced corrosion, and consequent weakening of the pipes; while the defendants maintained that it formed a crust which had a tendency to strengthen them. A number of exceptions were taken by the Company, none of which, however, went to the actual merits of the case, but related

to the admissibility of particular evidence, and the refusal of the Court to give certain rulings. In the result, the Company were found to be solely responsible for the accident. The case was taken to the Supreme Court, who, on the 18th ult., sustained in every particular the rulings of the Court below—their decision being adverse to the defendants on every point. While this does not preclude the Company from defending the other actions before a jury on questions of fact, it is regarded as extremely doubtful whether they will allow to go to trial any cases but those in which efforts to effect a settlement have been unavailing, seeing that the circumstances involved in the suit just determined are substantially the same as those forming the basis of the other actions arising out of the disaster. The adjudication is one of great moment; the damages amounting, according to the "Boston Advertiser," to which we are indebted for the latest particulars in reference to this matter, to approximately £200,000.

MR. LIVESEY ON THE PRICE OF COAL.

Brighter Prospects.

"The Times" last Wednesday contained a letter from Mr. George Livesey, in which he called special attention to "two ominous paragraphs" in the weekly market reports in that paper on the previous Monday, as evidence that producers of coal are getting anxious lest the largely reduced demand should compel a reduction of prices, which has already taken place in several directions. The paragraphs referred to are as follows:—

Barnsley, Nov. 10.—Many of the collieries in the district have played one or two days during the week, with a view to reducing the output to meet the altered conditions of trade. There have been suggestions that the miners should take the matter in hand and "play" a few days until trade recovers; but the men's leaders do not propose to adopt such a course at present.

Cardiff, Nov. 10.—In accordance with the decision of the South Wales Miners' Federation, the whole of the collieries in South Wales and Monmouthshire were idle on Friday; and work will not be fully resumed until next Monday. The object of the stoppage was to restrict the output, and by this artificial means to checkmate, if possible, the retrograde movement which has apparently commenced in the coal industry; and to-day "a delegate meeting will be held at Cardiff for the purpose of taking into consideration a proposal to empower the Council of the Federation to declare a general holiday whenever they deem it necessary in the interests of the workmen and the trade generally."

Commenting on these paragraphs, Mr. Livesey said: "One hardly expected that such action would be taken officially by the Trade Unions, though it certainly was expected that the miners would restrict output to prevent the accumulation of stocks of coal at the pits. Happily, no such action has any prospect of checking the downward movement in the price of coal which has now distinctly begun in obedience to the law of supply and demand. Last year at this time all our contractors were seriously falling behind in their deliveries, whereas now the contrary is the case, and offers are being made to supply increased quantities. The stocks of coal at gas-works are very large; and while twelve months ago the then stocks were rapidly decreasing, causing great anxiety, we are now quite happy on the point. From all I can see and learn, it appears that consumers of coal generally are in a similar position. This is largely due to the lessened demand for coal and coke by the iron trade—the main cause of the rise in 1898-9—and which, according to one of the highest authorities, passed its summit last spring. Since then the backward movement, according to your weekly reports, has been at an accelerating rate. In August last you gave a letter of mine on this subject the privilege of your columns, in which was the statement that, instead of coal being dearer in the winter, 'it is quite possible prices may then be lower.' Now everything points in that direction. We may have a severe winter, which may possibly cause a temporary spurt in prices; but this cannot last. It is at least to be hoped that consumers of coal will keep their heads—many lost them over 'the lowest summer prices'—and defer buying as long as possible, and then only from hand to mouth. The two Gas Companies whose policy I have a share in directing are following this course, having only lately obtained full supplies up to the end of the year, because they believe coal will be cheaper in January, and still lower in each succeeding month."

FATALITIES THROUGH INHALING GAS.

Mr. A. J. Martin Ball, the Mid-Gloucester Coroner, held an inquest at Ebley, near Stroud, last Thursday, on Mrs. Matthews, widow (75), and Ada, her daughter (33), who were found dead in their bedroom, poisoned by an escape of gas, on the previous Tuesday. The evidence showed that a steam-roller, which had been in use on Monday, had fractured a 2-inch gas-pipe, the gas escaping into an old stone drain which communicated with the cottage inhabited by the two women. When found, they had been dead for many hours, and the whole house was filled with gas. A verdict to the effect that death was caused by gas poisoning was returned; and the Jury added a rider that the defective state of the drainage practically caused the deaths of the deceased. On Monday, the 12th inst., an inquest was held by Mr. J. F. Price, County Coroner, on the body of Samuel Booth, engineer's labourer, 48 years of age, of Brook Street, South Reddish. Deceased was employed at the works of Messrs. J. E. H. Andrew and Co., Limited, gas-engine manufacturers, and was doing duty for a fellow-workman who was ill. He was found in the syphon pit, into which there had been an escape of gas, through injury to one of the inlet-pipes. A verdict of "Death by misadventure" was returned. Last Thursday, the Liverpool City Coroner (Mr. T. E. Sampson) held an inquiry into the circumstances relating to the death of Edward Stewart Martin, of Rhyl. Deceased was a steward on board a vessel, and on the afternoon of the 10th inst. he booked a bedroom for two nights at the cocoa-rooms in Hanover Square, Liverpool. The Manager's attention was drawn to deceased's room on the following morning. He entered, and found the room full of gas, the gas-tap being turned right on. Deceased was lying in the bed in a natural position. He was removed to the Northern Hospital, where he died later. Mr. E. Allen, Assistant-Engineer to the Gas Company, said that in the particular district in which the occurrence took place, only coal gas was supplied from eleven till six. During the other hours, a certain quantity of carburetted water gas was mixed with it; this was less injurious to health than the pure water gas. The proportion of water gas, taking the average of the day, would not be more than 28½ per cent. A post-mortem examination revealed the ordinary signs of coal-gas poisoning. The Jury returned a verdict to this effect.

ORIENTAL GAS COMPANY, LIMITED.

The Late Mr. John Blacket Gill.

The Ordinary General Meeting of this Company was held last Wednesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. R. Hesketh Jones in the chair.

Before commencing the business,

The Chairman said he had the melancholy statement to make that their friend and Chairman, Mr. John Blacket Gill, died on Sunday night. He wrote him (Mr. Jones) on Sunday, asking him to preside over this meeting, and adding: "I am sorry to say I have been unwell the last few weeks; and the doctor will not hear of me leaving home." This letter was received on Monday morning; and in the evening one came from Miss Gill, in which she said: "You will be grieved to hear that dear father passed away last night. The end was very sudden, though, of course, he had been ill for a long time." Before the shareholders parted, he should again have occasion to allude to their sad loss.

The Secretary (Mr. H. J. Luff) having read the notice convening the meeting, the report and accounts were taken as read.

The Chairman, in moving their adoption, said the first paragraph in the report alluded to the business of the Company during the past year; and it would be seen that the Directors referred to the increased revenue from gas. The sale of residuals, too, had been unprecedentedly good. The cost of coal per ton had been somewhat less; and the exchange also had been rather better—resulting in profits to the amount of upwards of £2000 in excess of the preceding year. But notwithstanding these increased profits, the Board did not recommend any increase in the dividends, but a continuation of their policy to build up a *bonâ fide* reserve fund, which now amounted to the respectable sum of £32,664. This policy had been endorsed by the shareholders on previous occasions; and he felt certain it would be again that day. The second paragraph alluded to an agreement having been entered into with the Municipal Commissioners of Howrah, on the other side of the river. It was a small district; and it had its own separate gas-works. For some few years before the new contract was entered into, the Company were supplying the public lamps on the terms of the expiring contract, and they were also supplying gas on the terms of the new contract for many months prior to the execution of that contract. He pointed this out in order to show that the shareholders must not be alarmed at the fact that the Company had not yet entered into a contract for the supply of gas to Calcutta proper. But with reference to the Howrah contract, he might say that they had introduced incandescent lighting throughout the district, and that it was working satisfactorily both to the public and themselves. He had no doubt the shareholders would be glad to hear something about the Calcutta contract. Last December the Directors submitted to the Corporation of Calcutta an offer for the public lighting of the city for ten years from May 1, 1901. This offer provided for the conversion of the whole of the public lamps, within a period of twelve months from the signing of the contract, to incandescent lighting similar to the lamps at Howrah. He need not refer to the terms, which were based on equitable prices as between the Corporation and the Company. Many reasons—changes in the constitution of the Municipality due to Imperial legislation, and the usual tardiness of municipal bodies to come to terms—had prevented them actually getting the contract signed; but the offer was being considered, and had been printed and circulated among the members of the Municipality. No objection had been raised to the terms of the offer; and a short time since the Company were requested by the Secretary of the Corporation to provide a stock of new lamp-posts and lanterns to meet an anticipated order for additional lamps to be erected. Therefore they might fairly hope that the offer would be accepted.

Mr. H. D. Ellis seconded the motion.

Mr. Samuel Spencer remarked that the Chairman's statement was very gratifying. Among other matters, he had told them that the price of coal had been slightly lower. This was so opposed to experience in this country, that he should like to know how the Directors managed it.

Mr. Edward Clark inquired what provision the Directors had made for coal during the ensuing year. In referring to the public lighting of Calcutta, the Chairman had not mentioned the price; and he (Mr. Clark) had no doubt he had acted wisely. But he thought it was only fair to the shareholders (some of whom were experts in the matter of gas supply) that the Chairman should tell them whether the price was higher, and a reasonable percentage higher, than it was previously. His object was an obvious one, as it had an important bearing upon the future of the Company.

The Chairman, in reply, said, with regard to the inquiry as to how they managed to get coal at a less rate than the previous year, it was due to the skill and watchfulness of their representative at Calcutta (Mr. D. C. Niven). The price was not much lower; but it was somewhat. Respecting the future provision of coal, he believed they were well covered for between one and two years, at prices which were fair and reasonable, and which would not put any additional burden on the Company. As to the price for the public lighting of Calcutta, he accepted the suggestion that it was wise he should not mention it; and he thought if the shareholders would be good enough to leave the matter entirely in the hands of the Directors, it would be more satisfactory than for him to make any comment on the tender they had made to the Corporation, which anyone could see in Calcutta, because, having been printed and circulated among members of the Corporation, it was now a public document. He might, however, say it was fair and equitable; and the Directors had taken steps to conserve the interests of the shareholders.

Mr. Clark: We leave it in your hands entirely.

The motion was unanimously carried.

On the proposition of Mr. R. Miller, seconded by Mr. A. T. Eastman,

a dividend of 4½ per cent. was declared, free of income-tax, making the distribution 8 per cent. for the year.

The CHAIRMAN said the next paragraph in the report referred to the retiring Directors; and in it the name of their late friend Mr. Blacket Gill was mentioned. As a matter of fact, they could not fill up the vacancy at this meeting; and he was sure the shareholders would think it very indecent if the Directors were to suggest a name. The matter would, in the ordinary course of business, be left in the hands of the Directors; and he felt that the shareholders would repose in the Board sufficient confidence that they would do their best in the selection of a successor to Mr. Gill. Before proceeding further, he would ask the shareholders to join with him in a vote of condolence to Mrs. Gill and her family; and he would propose—

That the Directors and Shareholders record their profound sorrow at the death of their late Chairman, Mr. John Blacket Gill. By his untimely death, after having been connected with the Company for thirteen years as Auditor and Director, the Board lose a most valued and genial colleague, who never flagged in his efforts to promote the best interests of the Company. The Directors and Shareholders desire to express their deepest sympathy and condolence with Mrs. Gill and family, on whom has fallen a blow profoundly felt by all who were privileged to share his friendship.

He (the Chairman) thought no words were needed by way of supplement to the resolution. He would ask Mr. Ellis to second it, and Mr. Williams, of the European Gas Company, to support it. Mr. Gill had been the Chairman of both the Commercial and the European Companies.

Mr. H. D. ELLIS said that it was his special privilege to second this very melancholy vote of condolence. He did not know whether there were many proprietors in the room who had known their late Chairman as he had done; but if there were, they would feel that theirs was no common loss. It had been his pleasure and privilege—he said "privilege" emphatically—to be associated with Mr. Gill in the business of this and another Company for more than twenty years; and he could honestly say that each year had only strengthened the feelings of attachment and admiration that a character such as his inspired. He (Mr. Ellis) knew of no man more beloved or more respected. His probity of character, his charming manner, and his unaffected kindness, thought, and consideration for all endeared him wherever he went. A man of such a character was not easily replaced. He could not say more.

Mr. W. WILLIAMS said, as one who had worked under the Chairman, travelled with him, and had had many opportunities of appreciating his good qualities, he could endorse, from his own personal knowledge, all that had been said as to his unfailing tact, kindness, and ability. Mr. Gill always showed shrewd common sense in his judgments, and he cared more for solid results than for showy figures. The consideration which he always evinced for those beneath him made him esteemed and respected by the staffs of every Company with which he was connected.

Mr. E. T. E. BESLEY, Q.C., wished to be allowed to say that he had been a colleague of Mr. Gill on the Board of the Commercial and European Gas Companies for some years; and he could unhesitatingly say that the loss they had sustained was irreparable. That was a phrase of the day perhaps; but his colleagues felt its actual meaning—that they would not find anyone to fill his place in the same way that he had filled it. His qualities were very marked, and at the same time very rare. He was a man of a singularly straightforward bent of mind and inclination. He was amiable to a degree; and he endeared himself to everyone with whom he came in contact.

Mr. SPENCER, speaking for the shareholders who were not identified with Mr. Gill in any official capacity, added an expression of deep sorrow, and referred to the courteous manner in which their late Chairman always conducted the proceedings at the meetings.

The resolution was unanimously agreed to.

Mr. A. T. Eastman was then re-elected to his seat at the Board, on the motion of the CHAIRMAN, seconded by Mr. H. D. ELLIS; and the Auditors (Messrs. S. W. Savage and W. Williams) were re-appointed, on the proposition of Mr. SPENCER, seconded by Mr. E. F. WHITE.

The CHAIRMAN moved a special vote of thanks to the Company's Manager, Mr. Niven. In the course of his remarks, he said he had no doubt the shareholders saw some time ago that Calcutta was flooded, and Howrah especially, to the extent of something like 4 feet in the streets. The Directors were naturally very anxious at the time; and they cabled to Mr. Niven for information. They received two letters from him, which showed that he had the matter well in hand. On October 18, he wrote that the Howrah Gas-Works were then in working order; and on October 25, he wrote that everything was satisfactory there. In the latter communication, Mr. Niven also stated that Mr. J. C. Watson, the Assistant Engineer, had been in charge of the Howrah works for the past three years. Owing, however, to the floods, the state of the works was too serious to allow him (Mr. Niven) to depute the restoration to another; and therefore he had seen to the work himself. Mr. Watson had had plenty to do in seeing that the men attended to the syphons in the streets of Calcutta. Mr. Niven also mentioned that he would shortly send a report as to the simplest and most effective plan of preparing for a flood of this kind, to prevent the works being damaged or in any way affected in their working. Mr. Niven, the Chairman added, took every precaution to satisfy the public. The retort-house was flooded; and they could not make gas for about twelve days. In the meantime, Mr. Niven provided oil-lamps in the district, and took care to light the East India Railway Company's station. He did everything that a man possibly could do under the circumstances; and he must have worked night and day—being most ably assisted by Mr. Watson. It was therefore a pleasure to propose a hearty vote of thanks to both Mr. Niven and Mr. Watson.

Mr. ELLIS seconded the motion, which was heartily agreed to.

The thanks of the shareholders were also accorded to the Chairman and Directors, on the proposition of Mr. BESLEY, seconded by Mr. N. E. B. GAREY.

A similar acknowledgment of the services of the Secretary and London staff concluded the meeting.

Dr. Bishop has been elected Chairman of the Electricity Committee of the Manchester Corporation, in succession to Mr. Lloyd Higginbottom. The Chief Electrical Engineer (Mr. C. H. Wordingham) has intimated his intention of not seeking a renewal of his engagement with the Committee at the termination of his agreement in March next.

SOUTHAMPTON GAS COMPANY.

The Half-Yearly General Meeting of this Company was recently held at the Offices in Southampton—Mr. R. C. HANKINSON, J.P., in the chair.

The SECRETARY (Mr. C. Crowther Smith) having read the notice convening the meeting, the report of the Directors was presented. It set forth that the sum available for distribution was £10,892; and the payment of the maximum dividends on the ordinary stock, amounting to £9228, for the half year ending June 30, less income-tax, was recommended. This would leave £1664 to be carried forward. During the half year there had been an increased sale of 21,807,000 cubic feet of gas, as compared with the June half of 1899. Upwards of 2750 prepayment meters had been fixed, and a further increase under this system was assured.

The CHAIRMAN, in moving the adoption of the report, said he thought he might congratulate the proprietors that, upon the whole, it was satisfactory, considering all the circumstances. The first thing that struck one was, of course, the considerable increase in the sale of gas, notwithstanding the competition they had to contend with in the lighting of the town by electricity. During the six months, there had been an increased sale of 21,807,000 cubic feet of gas, as compared with the June half of 1899. This represented 10 per cent. on the Company's business; and he might mention that it was fairly distributed throughout the district. Of course, it would be foolish to ignore the fact that the electric light affected the Company in the town proper; but they did not feel it in the district. Then the day consumption of gas was much greater than it used to be, by means of cooking-stoves and so forth; and there were also a good many gas-engines. One significant cause of the increase was the adoption of the prepayment meter system. There were now as many as 2250 of such meters fixed in the town, and the demand for them was growing every day; and the fact remained that the augmented sale was larger than it had been during any half year in the history of the Company. Increased business meant, of course, additional capital. They had had several sales of stock lately, and he thought they might congratulate themselves on the excellent prices obtained. In July the average was £117, and in October £115—the decline not being surprising, considering the depressed state of the Money Market and the condition of the country generally. The Directors had had, very reluctantly of course, to raise the price of gas; but he was pleased to say they had had very few complaints about it, for everybody had sense enough to know that gas could not be made without coal, and that if coal was dear the price of gas must be raised. Another serious item of expenditure arose from the extension of the Company's works; and a further one, which was absolutely necessary, was caused by the erection of a new gasholder, which would be a very large one, containing, in fact, as much as all the others put together. This was a very expensive matter; but the Directors had gone to work about it the best way they could, under the advice of their excellent Consulting Engineer, Mr. J. B. Paddon. The holder was already begun, and they hoped it would be finished next summer, and be ready for work the following winter. The profit and loss account was very satisfactory. The past half year was not the best the Company had had, but within £40 they had earned the maximum dividends; paying the balance out of the amount brought forward, and carrying forward £1664. The Directors considered this a very satisfactory outcome of the half-year's working. Of course, enlargement of their business meant an increase of labour for the officials all round. No one knew more of the value of the work performed by their Secretary than the Directors; and they thought the time had come when his salary should be raised. The capital account had increased from £241,000 to nearly £500,000, including premiums, which meant a great deal of additional, and very anxious, work for the Secretary, in whose ability, energy, and integrity the Directors had the greatest confidence. They therefore suggested that his salary should be increased by £100 a year.

Mr. J. K. SAMPSON seconded the motion; and it was carried unanimously.

The proposal as to the Secretary's salary was then agreed to *nem. dis.*

The SECRETARY, in returning thanks, said the kind and courteous manner in which the suggestion had been received would stimulate him to renewed energy in the performance of his duties.

The maximum dividends were declared; and the proceedings closed with votes of thanks to the Chairman and Directors, and also to the Secretary, Manager (Mr. S. W. Durkin), and staff generally.

ELECTRIC LIGHTING NOTES.

The electric light undertaking of the Yarmouth Corporation must be a source of great disappointment to the members. The half-yearly report which the Electric Lighting Committee laid before them last Tuesday showed that the income for the two quarters failed to meet the expenditure by £405. In the corresponding period of last year, £441 was cleared, which is not much to boast about.

The Board of Trade have given the Limerick Corporation a little more grace in regard to the carrying out of their Electric Lighting Order. But if definite steps are not taken within twelve months, the Board intimate that they will not feel justified in allowing the Order to remain in force. A deputation has been appointed by the Corporation to wait on the Local Government Board to secure sanction to a loan.

At the meeting of the Court of Common Council last Thursday, the Chairman of the Streets Committee (Mr. A. B. Hudson) presented a report, which had been ordered at the previous meeting to be printed, giving effect to sundry recommendations, and submitting a scheme for the testing in future of all electricity meters for use in the City under the direction of the Electric Inspector, at the expense of the City of London Electric Lighting Company and the Charing Cross and Strand Electricity Supply Corporation (the electric lighting undertakers each to refund, in addition to the other expenses, a sum of £200 per annum to the Corporation in respect of the Electric Inspector's salary); recommending that, subject to agreements being entered into with the Companies to give effect to the proposed arrangements, Mr. Voysey's salary be increased from £350 to £500 per annum from Midsummer last; and pointing out that the acceptance of the Committee's recommendations will relieve the Corporation in future of all expenses connected with the appointment of an Electric Inspector, which at present amount to about

£350 per annum. Draft agreements were also submitted to give effect to the foregoing arrangement; and recommending that it be approved, and referred back to the Committee to complete the matter with the Companies concerned on the basis of the draft agreements. The course suggested was followed.

Particulars have just been published of an important scheme for the supply of electricity in bulk in Yorkshire. A Company, which has been registered under the title of the Yorkshire Electric Power Syndicate, Limited, will shortly apply to Parliament for power to supply electricity in bulk to local and other authorities, as well as to colliery owners, manufacturers, and others throughout the southern or manufacturing portion of the West Riding of the county of York. The portion included in the scheme is that lying south of the Rivers Wharfe and Ouse, and the turnpike road from Bolton Bridge through Elsack and Skipton to Foulridge on the Lancashire boundary. The area is about 1800 square miles, with a population of about 2¼ millions.

Judging from what transpired at the meeting of the Ventnor District Council on Monday last week, the electric lighting in the town has for some time been causing dissatisfaction. Mr. Vincent asked for an explanation of this; saying he had been expecting to hear something about it. At the west end of the town several of the arc lamps had been out during the previous few nights, and even the preceding evening it was still the case with some of them. He did not know whether any communication on the subject had been received from the Electric Lighting Company. At any rate, some action should be taken in the matter. The Chairman (Dr. Robertson) said the Works Committee had communicated with the Company on the subject, but no reply had been received. Mr. Vincent said they wanted some guarantee that this sort of thing was not going to continue. If it had not been for the moonlight nights, the streets would have been quite dangerous. Mr. Grant said the unsatisfactory light given by the arc lamps ought to be taken notice of. He thought the time had come when the system of lighting by arc lamps should be better than was the case at present. Two or three letters on the general lighting of the town had been sent to the Company by direction of the Works Committee. Mr. Wetherick counselled a little patience and forbearance in this matter, seeing that the Company were doing their utmost to remedy the defect in the current, a matter over which they had no control. At the same time he recognized that the Council must keep the Company up to the mark, and see that the town had what it was paying for. The Chairman said he thought they must recognize that the Company were doing their utmost to render the period of gloom as short as possible.

Last Thursday, Mr. H. P. Boulnois, one of the Inspectors of the Local Government Board, held an inquiry at Colne, relative to the application of the Colne Corporation for power to borrow £39,000 for carrying out electric light works. The Town Clerk (Mr. A. Varley) explained that the scheme comprises the provision of a generating station, the laying of cables through the main streets of the town to the village of Trawden, and the supply of current for a light railway as well as for illumination. The plant would, when completed, be capable of simultaneously working 10,000 8-candle lamps. There would be four dynamos—two for the ordinary lighting, one for the supply of the current to the tramways, and one for use in case of emergency. The revenue was based on 10,000 lamps at an average of 4½d. per unit, the income from which would be £3000. The plant was equal to dealing with about 30 per cent. in excess of this number, and the estimated revenue from street-lamps (20 arcs and 40 incandescents) would make the total stand at £4733. Deducting the cost of management, interest, payment to the sinking fund, &c., would leave a profit of £279. With regard to private lighting, it was estimated on the basis of 6d. for the first hour and 2½d. per hour afterwards. With gas at 2s. 9d. per 1000 cubic feet—the present rate—the difference on a two hours' daily demand would be small; but electricity would compare favourably with gas. The gas undertaking was a valuable asset to the town—the profits from it during the past year being £4000, which was equal to a rate of 1s. in the pound; and by this means the Corporation were able to reduce the rates by 3d. in the pound. If the Corporation could rely on the experience of other towns, it was thought that the Gas Department would not be affected by the Electrical Committee. Mr. Hewitt, a member of the Corporation, said the site for the generating station was a very suitable one, and the destructor would save a certain amount in the cost of fuel. He believed that the electric light would be generally adopted, and that tradespeople would introduce small motors into their works. There was no opposition to the application.

Three fatalities connected with electric light undertakings have to be recorded. On Monday last week, Mr. Thomas Griffiths, the Electrician in charge of the Newport Corporation electricity station, was found dead in front of the main switch-board at the works. An examination of the board suggested the conclusion that deceased was engaged at the time in screwing up a nut on a portion of the apparatus, the current from which had been turned off for the purpose. He was in a stooping or bending attitude while using the spanner on the nut. The spanner slipped, and the wrench threw deceased's left knee against a live portion of the apparatus. There was a slight mark of burning at the point of the knee-cap where current at 2000 volts had entered the body. The current took an upward course, running down the right arm to the spanner, and then to earth. The safeguards provided against accident at the works are considered to be among the best in the kingdom; and the accident appears to have been due to pure misadventure. On the following afternoon, a shocking accident occurred at the sub-station of the Cheltenham Corporation Electric Light Works. A fitter, named Richard Edwards, 29, was making a joint of wires in the basement when, suddenly, a cry was heard, and his fellow-workmen, who ran to the spot, found Edwards lying on the floor unconscious. Doctors were called in and efforts made to restore animation by artificial means, but without avail. The body bore no mark of contact with the wires, and death was said to be due to failure of the heart's action caused by electric shock. Early last week, an assistant engineer named Rowland Herbert Peckworth, employed by the Metropolitan Electric Supply Company at their South Street, Marylebone, station, was connecting some cables, but instead of taking hold of the insulated handles he by mistake touched the metal work of the switch-board with both hands. The wires were fully charged, the current passed through him, and he fell dead. At the inquest last Thursday, the Jury returned a verdict of "Accidental death," but recommended that the switches should be protected in future.

THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

A Purchase Bill to be Promoted.

At the Meeting of the London County Council last Tuesday—Mr. W. H. Dickinson in the chair—the report of the Water Committee presented at the preceding meeting, and given in the "Journal" for the 6th inst. (p. 1160), recommending that a Bill should be promoted next session for the purchase by the Council of the undertakings of the eight Metropolitan Water Companies, was considered.

The adoption of the report having been formally moved,

Mr. P. Harris said he thought the minority in the Council would wish to define their position. The report was not very explicit; but he gathered that the proposal was to introduce the identical Bill which was rejected by the House of Commons last session. The Committee scarcely pretended to think there was much chance of it passing; and, in effect, they said they did not expect it to do so, but that it would only cost £200 to carry it up to the second reading. As a sort of make-weight, the Committee threw in the curious argument that the Council were only being asked to vote on a kind of pious pronouncement with regard to purchase. As a fact, what they were asked to vote upon was a Bill for the purchase of the undertakings of the Water Companies by the Council, and without any indication as to what should be the management after purchase. It was stated in the report that the Royal Commission confirmed the policy of purchase; but there was the question of management afterwards, and the Committee asked them to go forward for purchase without any arrangement being made for management. The Royal Commission did not recommend purchase in the abstract, but purchase and management by a joint authority. If the Council wished to settle the question, the only chance of doing so was to go forward with a Bill on these lines. To give the Council a chance of adopting the alternative, he moved, as an amendment—"That a Bill be promoted in the session of 1901 for giving effect to the main principles in the report of the Royal Commission."

Mr. Cohen, M.P., seconded the amendment, and asked the Chairman of the Water Committee whether he conscientiously believed there was a ghost of a chance of such a Bill as that proposed by them passing.

Sir Arthur Arnold considered that the Committee's report was the only possible solution of the question, and he saw no difficulty in reconciling the recommendations of the Royal Commission with purchase by the Council. The initial step of purchase must, in his opinion, be undertaken by the Council; and he trusted that they would never submit, as the greatest rating authority, to make over to another body powers with regard to rates in this matter.

Colonel Rotton observed that the Progressives were going to spend the ratepayers' money on a Bill which they knew would not be passed. The Royal Commission had made up their minds that the County Council should not be the body to manage the water supply of London.

Mr. Shaw Lefevre said he doubted very much whether the recommendation of the Royal Commission could possibly be carried out in its entirety. The alternative was that the purchase should be made by the Council. In any case, the purchase must be made and carried out by the Council; and to attempt to constitute a Board to take this out of their hands and enter into a bargain independently of them would only end in disastrous results to London and the ratepayers generally. When the purchase had been made by the Council, the question of management of the water supply might be open to compromise; and they would not be unprepared to listen to what the outside Local Authorities had to say on the matter. He hoped the recommendation would be adopted.

Mr. Whitmore, M.P., supported the amendment, and said the real question raised was whether, by introducing the suggested Bill, they would be promoting a practical solution of the water problem. If they passed the recommendation, there was no possibility that they could advance the matter one step farther in the next session. There could be no question that if the Council were perverse enough to reintroduce their Purchase Bill, it would meet with precisely the same fate as it did last session. It seemed to him that the Progressives were pushing their own fads instead of showing any desire to add to the practical solution of this question.

Mr. Beachcroft said the Moderate Party were quite as anxious to settle the water question as the Progressives; but the latter would never do it unless they took a more reasonable view of the matter. He thought the members of the Council and the citizens of London should alike be grateful to the Government for carrying out the admirable piece of legislation which allowed of the Water Companies connecting their mains, as this had enabled the people to be supplied with water during the past summer without failure.

Colonel Ford doubted the wisdom of the Progressive leaders in introducing the Purchase Bill again next session, because it was clear that the Government would have nothing to do with the water policy of the Council. He therefore saw little use in knocking their heads against a brick wall. Still, they had heard of lambs being led to the slaughter, and, as a Progressive, he supposed he would be dragged there.

Mr. M'Kinnon Wood (Chairman of the Committee) said he had no objection to go to the Government again, for his patience was inexhaustible; but they had received no indication that the Government intended to deal with the matter. No one had objected to the Council's policy with regard to the terms of purchase. The whole question was narrowed down to whether they could accept the recommendations of the Royal Commission with regard to the controlling authority. They could not agree with these recommendations, as they were so palpably unjust and placed the Council in such a miserable minority on the proposed Water Board.

The Council then divided, and the amendment was lost by 77 votes to 44—a majority of 33.

Mr. Campbell moved a further amendment to the effect that no Bill be introduced, but that the Government be pressed to legislate on the subject next session. He contended that, by adopting such a course, they would force the Government to show their hand, and thus save the ratepayers' money.

Mr. Cousens seconded the amendment.

Mr. Stuart, alluding to a statement made that £25,000 had been spent on the promotion of water legislation, said it was money well laid

out, although they were now asked to throw away a vast asset. Such dilatory amendments would cost the ratepayers thousands of pounds.

After some further discussion, the amendment was rejected, and the recommendation of the Committee was carried, on a division, by 71 votes to 43—a majority of 28.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Meeting was held at the Company's Offices, Marylebone Road, on Tuesday, the 13th inst., under the presidency of Mr. E. Boulnois, M.P.

The Secretary (Mr. F. H. Wybroo) read the notice calling the meeting, and subsequently the report of the Auditors. This stated that the revenue for the half year ended Michaelmas had been £145,965; being an increase of £2777 as compared with that for the corresponding period of 1899. The water-rental received during the half year had been £124,766. The balance to the credit of the dividend and interest account was £69,339.

The Chairman, in moving the adoption of the report and accounts, stated that it was not necessary for him to make any prolonged observations on the report, because it set out fully important matters which had concerned the Company during the half year, and matters which were also in the future. The 42-inch main from Hampton to Barnes was very nearly completed—that was to say, 9½ miles out of a total distance of 10 miles had been laid, and the shafts and tunnel for carrying the main under the River Thames between Isleworth and Richmond had been completed. In addition to this, two of the new filter-beds at Barn Elms were finished; and the third one was expected to be completed by the end of this year. The number of new supplies laid on during the six months was 891; and the Company's constantly increasing district naturally required constantly increasing expenditure, in order to keep pace with the demands. There was still a large area to the north of London left uncovered with houses; but at the rate at which building was going on in this direction, he expected that the limit of the Company's boundary would be reached before very long. The Local Government Board, having held an inquiry into the scheme of intercommunication between the works of the eight Metropolitan Water Companies which had been submitted to them, had intimated their approval of the scheme generally, and had requested to be furnished with details, plans, and estimates, which were now being prepared. During the past summer, which was again exceptionally dry—and during which, again, a normal amount of rain did not fall—he believed he was right in saying that no inconvenience was experienced by any inhabitant of London owing to shortness of water; and although there was a slight breakdown in connection with one Company, yet this was not owing to any deficiency of water, but from other causes. In any case, each Company now had such ample storage, and the arrangements made and contemplated for intercourse between all the Metropolitan Water Companies were so complete, that there was no fear that any part of London would ever again be subjected at any time to scarcity of water. Great progress had been made during the year with the works now being carried out by the Staines Reservoirs Joint Committee—representing the West Middlesex, the Grand Junction, and the New River Companies—and one of the two great reservoirs in course of construction was fast approaching completion. When this stupendous work was finished, their Company, at all events, would feel satisfied that they had marched with the times, and had looked well ahead as regarded future requirements. He had been in great hope that they would have had a respite from the attacks of the London County Council, and that, with the report of the Royal Commission, they would have had peace, at all events for a time. This, however, was not to be, for he had no doubt whatever that the Progressives would carry at the meeting of the London County Council that day the recommendation which would be brought up from their Water Committee, that a Bill should be promoted in the next session of Parliament for the purchase by the Council of the undertakings of the eight Metropolitan Water Companies. He could not help saying he thought that this was a wanton proceeding; for the Water Committee of the Council themselves hinted that they probably would not be successful with their Bill, and personally he had no doubt whatever that the new House of Commons, like the old, would summarily reject any Bill which was not based upon the recommendations of the Royal Commission that had so recently, and so fully, reported upon the whole question of the water supply of the Metropolis. He now came to what was, perhaps, a serious thing for the time being, and one which might become more serious unless matters were expedited. In the last paragraph of the Directors' report, the attention of the proprietors was drawn to the circumstance that the accounts did not bear the signature and certificate of the Official Auditor. This was not due to any objection which Mr. Stoneham had made to the accounts, but because no decision had yet been obtained as to the two objections which were raised by that gentleman on the previous accounts. One objection was to an expenditure which their Company incurred, in conjunction with all the other Metropolitan Water Companies, in opposing on Standing Orders in the House of Commons the Bill which was introduced in the session of 1899 for authorizing the London County Council to purchase land and to construct gigantic reservoirs in Wales. The Directors, in joining with the other Water Companies in opposing the Bill at an early stage, had no doubt but that they were acting within their powers; and they considered that, in doing so, they were taking the best means of safeguarding and protecting the proprietors' interests, and of avoiding the much greater expense of having to oppose the Bill at a later stage. It appeared to the Board to be entirely a matter of policy and management; and they could hardly believe that any arbitrator would decide that they were to sit with folded hands, and do nothing to protect the enormous interests committed to their charge—interests which were being so openly attacked. The delay in obtaining a decision on this point was not owing to any wish or fault of the Directors; but he was advised that it was entirely in consequence of Mr. Stoneham's omission to specify, as he was required to do by the Act of Parliament, the manner in which he desired the accounts to be altered, although it had been pointed out to him, and he had been asked to state his actual requirements. The Official Auditor's other objection related to the amount of payment made by the Company to what was called the City Chamberlain's fund—a payment made on the first issue of the debenture stock which was raised under the Company's Act of 1894, which Mr. Stoneham considered was about £600 less than it should have been. As he (the Chairman) explained when addressing the proprietors on a former occasion, this question was complicated by the Company's connection with the Staines Reservoirs Joint Committee; and it also depended on a point which had been raised as to the time when the liability of the three Companies to make their payments to the Joint Committee commenced. The Directors were doing their best to obtain a decision on these various matters; it being most important that they should be shortly settled, as, by the Act of Parliament, no further dividend beyond the one to be passed at this meeting could be declared until the Official Auditor had certified the accounts. He hoped that he had made his explanation clear with respect to the last paragraph in the Directors' report; but he would be glad to answer any questions.

The Deputy-Chairman (Mr. Jackson Hunt) seconded the motion.

The Chairman, in answer to questions by Mr. Beare and Mr. Rankin, repeated that, unless the Official Auditor certified and signed the accounts, the Directors would not be able to declare a dividend after the one which was to be proposed that day. The dividend would be earned; but the Directors would be powerless to declare it unless they could press the Official Auditor to come to some conclusion so that he might certify the accounts. The Arbitrator had not been appointed yet, because they could not get Mr. Stoneham to say what his requirements were and what alterations he desired made in the accounts.

The motion was then unanimously adopted.

A resolution was afterwards passed declaring a dividend on the consolidated stock for the half year to Sept. 30 at the rate of 10 per cent. per annum, payable, less income-tax, on and after Jan. 5.

Mr. Howson then proposed, and Mr. Gundry seconded, a resolution thanking the Auditors for their careful examination of the accounts.

The Chairman stated that the accounts had, of course, been signed by the Company's Auditors, who had certified them to be correct.

The motion was carried unanimously.

Mr. Wakeman-Newport next proposed a vote of thanks to the Chairman and Directors.

Mr. Howson seconded the motion, which was carried unanimously, and suitably acknowledged.

The Chairman then proposed—"That the debenture stock authorized to be raised by the West Middlesex Water-Works Act, 1899, be, in exercise of the powers conferred on the Company by that Act, hereby created; and that the stock thus created be issued and disposed of by the Directors in such proportions, on such terms and conditions, at such times, and in such manner, consistent with the provisions of the said Act, as may by the Directors be deemed expedient from time to time."

The Deputy-Chairman seconded the motion, which was carried unanimously.

The proceedings then terminated.

PORTSMOUTH WATER COMPANY.

A Concession to the Consumers.

The proceedings at the Half-Yearly General Meeting of the above-named Company on the 22nd inst. will be of more than usual interest, inasmuch as the shareholders will be asked to make an important concession to the consumers in the shape of a reduction in their rates. According to the report just issued by the Directors, they propose that the charge for water supplied for domestic purposes shall be based, as from the 29th of September, upon the rateable value of the premises supplied, instead of, as heretofore, upon the full rent, or annual value; at the same time reserving the Company's right to revert to the higher scale. It appears that this question was raised by the Corporation some time back, and though the Directors have always been advised by their Solicitor that their charges were justified by their Act of Parliament, and though they have already made many concessions to the consumers by the remission or reduction of extra charges, they are of opinion that the time has come when the shareholders may, with safety to their maximum statutory dividends, permit the public to still further share the increased profits arising from the undertaking by voluntarily conceding to them this further important reduction. With regard to the works, during the half year 2953 yards of additional service-mains were laid in new roads; making a total of about 46 miles of trunk-mains, and 129 miles of service-mains. The number of additional services connected with the mains during the half year was 560; making the number of premises now under constant supply by the Company in all the districts 40,316. The quantity of water pumped from Havant and Bedhampton in the six months was 1,426,957,000 gallons, or an average daily supply for all purposes of 7,840,000 gallons; being an increase of 497,000 gallons daily, as compared with the corresponding period of last year. The quantity supplied for domestic use was equal to an average of 30¾ gallons per diem per head of the population, exclusive of all supplies by meter. The number of fire hydrants now fixed in the Company's district is 3187. The Engineers (Messrs. J. Quick and Son, MM.Inst.C.E.) report that the engines, boilers, reservoirs, and works are in good order. In view of the rapid growth of the business of the Company, the Directors have resolved to construct a new rising main from Bedhampton to the reservoirs on Portsdown Hill, and another from Hilsea to East Southsea. The accounts accompanying the report show that the balance on the profit and loss account is £28,277, out of which the Directors recommend the payment of the full statutory dividends. After reductions for void houses, &c., this will leave a balance of about £12,515 to be carried forward.

A Pan-American Exposition will be held in Buffalo, New York, from the beginning of May to the end of October next year. There will be a large building for electrical exhibits, and in it will be the service plant, for the transformation and distribution of the 5000-horse power transmitted from Niagara Falls, for lighting and power purposes. There will also be the commercial exhibit, showing articles possessing distinctive merit, whether in respect of workmanship, novelty, or usefulness.

HARROGATE CORPORATION WATER SCHEME.

The Agreement with Leeds—Provision for Ripon.

A Special Meeting of the Harrogate Town Council was held last Tuesday, to receive and consider a report from the Water Committee as to the arrangements that had been made with the Parliamentary Committee of the Leeds Corporation respecting the Bill which Harrogate proposed to promote in the ensuing session of Parliament, to acquire an additional water supply from the Agil and Arnagill on Lord Masham's estate. Alderman Fortune reported that the Water Committee had arranged with the Leeds Corporation respecting the water supply from the Burn. The difficulty they had to contend with in the first instance was that they thought Harrogate ought to have taken the water from the Skell, instead of the Burn. The Harrogate deputation clearly proved to Leeds that if Harrogate took the water from the Skell, the levels were not suitable for gravity to their reservoirs; and eventually arrangements were made that Leeds should take the Skell, and Harrogate the portion of the Burn they had mapped out for their gathering-ground. This, they estimated, would give 3 million gallons per day; but, of course, compensation would have to be taken out of this. They were, however, desirous of limiting their demand, so far as the Burn was concerned, to 2 million gallons per day, or 730 million gallons a year. At the same time, if there were a certain number of days when Harrogate did not take any water from the Burn, they would be allowed to take 2½ million gallons per day until they had made up the deficiency, but not to take more than 730 millions in a year. This Harrogate agreed to; and then came the question of the Ripon supply. The Leeds reservoirs were at a rather lower elevation than the Harrogate ones. As a consequence, Leeds could not very well supply Ripon to advantage. As Harrogate had offered previously to supply Ripon, it was decided that Harrogate should give that supply. The deputation pointed out to the Leeds representatives that the Ripon supply ought to be over and above the 2 million gallons per day; and it was eventually arranged that Ripon's supply should be in addition, and that Ripon, if they desired it, should have 150,000 gallons per day—making a total of 784,750,000 gallons in the year for Harrogate and Ripon. Harrogate had fixed the price at 6d. per 1000 gallons. Leeds and Harrogate had agreed to support both Bills. It was decided to promote a Bill accordingly.

PROPOSED WATER BOARD FOR ILKESTON AND HEANOR.

The Unexpected Difficulties.

The consideration of the question of obtaining a supply of water from the Meerbrook Sough, either alone or in conjunction with the Heanor District Council, was the object of a special meeting of the Ilkeston Town Council last Tuesday. It was explained by the Town Clerk that the scheme could be carried through by the promotion of a Bill; but the difficulties were of no light character. From the information laid before the members, it appeared that the Sough Company were in a somewhat unfortunate position in regard to the water of the Sough. On the one hand, the mineowners found they were under no obligation to allow their water to flow into the Sough. On the other, the landowners below them were entitled to all the water which flowed into and out of the Sough. If this view was correct, the Joint Board, on acquiring the Sough Company's undertaking, would have by the Bill to deprive the mineowners of their right to prevent the water flowing into the Sough; and in this case they would have to pay compensation. They would also have to pay compensation to the owners down the river. It was evident that the Council would undertake the position of the owners of the land that joined the Sough, because it was not for their convenience that the water was taken into the Sough; but as they knew it was to drain the working in order that the miners might work. Therefore the owners of the land through which the Sough passed clearly had no legal claim to any legal compensation for allowing the water to flow into the Sough. Consequently, it was probable that the mineowners were at the present time under no obligation to see that the water they discharged into the Sough was of the high quality it at present possessed. So it would also be necessary to prohibit them from polluting it; and for this prohibition they might successfully claim compensation. The Corporation, in their Bill, would provide a clause to prevent people from polluting the stream or any feeder running into the stream. These items of compensation might considerably increase the cost of the scheme, and in any case the cost would be difficult to estimate. On the whole the Bill would be, in the opinion of all who had been consulted, a difficult one to get through Parliament; and the question of providing compensation water was fraught with the greatest difficulty. This was in brief the information the Town Clerk had to impart for the guidance of the Council. After discussion, a resolution was passed, approving of the idea of a petition to Parliament for the granting of power to obtain the proposed water supply. An amendment was moved deferring the matter for twelve months; but on being put, the resolution was carried.

Salford Water Supply.—Considerable dissatisfaction having arisen in Salford at the existing arrangement with Manchester for the supply of water to the borough, a special meeting of the Town Council was held last Wednesday, to consider the advisability of promoting a Bill next session in reference to the matter. Its principal objects will be the following: To amend the Salford Improvement Act, 1862, so as to place an obligation on the Manchester Corporation to supply to the Salford Corporation, at a price fixed by an independent authority, such quantity of water in bulk as they may require for all purposes, in addition to the 2 million gallons specified in the Acts contained in the schedule to the Salford Improvement Act, 1862; to fix or provide for the fixing of the point or points at which, and the pressure under which, such supply shall be given; to empower the Corporation to borrow money for, or in relation to, any of the purposes of the Bill, and to enter into and fulfil agreements for such purposes. The Mayor (Alderman Rudman) observed that, owing to the deficient pressure of water available at a recent fire, the brigade had been obliged to have recourse to a private reservoir supply near. Theirs was a community with an enormous population, increasing every year; and they could not possibly go on under the present conditions. He moved that the Bill be sanctioned; and this was agreed to.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I think the most important subject for comment this week is the price of coal. "The price of coal is coming down, and frantic efforts are being made to conceal it," was the remark of a coal merchant to me two days ago. He informed me that he can buy coal for forward delivery 5s. per ton cheaper than he could two months ago; that he is being pressed to buy, as if somebody wanted to unload; and that one traveller in particular had endeavoured to get him to take a certain coal, and was non-plussed by the remark that the same coal could be had for 1s. 1d. per ton less than he was offering it at. The information is not mine; but it is concurrent with my observation of the coal market. The pity is that so much has been contracted for at a high figure.

To all appearance, the last has not been heard of the recent testing by Mr. John Hunter, of Edinburgh, Public Analyst for Dalkeith, of the gas supplied by the Dalkeith Gas Company. On Thursday, Mr. Hunter published in the "Scotsman" a letter in which he seeks to put right what he considers erroneous assertions. The statement that he had refused information as to where and how his tests were made he says is seriously misleading, because he informed the Manager that, if he got the consent of his client, he would most willingly give him all the information he desired. Well, if this is not refusing to give information, I cannot understand what it is. Mr. Hunter subscribes himself "Public Analyst," and he speaks of a client. If he tested the gas in his capacity of Public Analyst, his client could be no other than the Town Council; and the Gas Company can obtain from the Town Clerk a copy of Mr. Hunter's report to the Town Council, which should contain the particulars they want. A serious difficulty, however, arises when it is recollected that Mr. Hunter is not Gas Examiner for Dalkeith, there being no such office, but simply Public Analyst; and that the statutes which deal with analysis require that notice shall be given to the person whose goods are to be analyzed. This was not done in the present instance; and, without going the length of saying that Mr. Hunter has done anything which can be called blameworthy, I think he will himself see that he has not—perhaps he will say it is his client who has not—treated the Gas Company with perfect fairness. I understand it has been widely advertised in Dalkeith that the tests were made under the new conditions laid down by the London Gas Referees. That is very strange. Who, in Dalkeith, is so much interested in the purity of the gas supplied by the Company, as to be prepared to spend £200 or £300 in fitting up a photometer-station for, so far as is known, one test only? I imagine it was a portable photometer which was used; but I do not think the London Gas Referees have yet been permitted to found upon the results obtained by the portable photometer. I expect it comes to this—that Mr. Hunter was simply playing at analysis; and that there were so many essential conditions wanting from his process that, if he were to attempt to make the slightest use of his results, he would make a laughing-stock of himself. I do not say anything about such matters as the condition of the fittings, because these will occur to everyone as possibilities which would affect the illuminating power of the gas; but I wish to raise the question of how it would be possible to produce gas of 15·9-candle power from coal, of which there were three varieties, used in equal proportions, yielding 33, 25, and 18 candle gas respectively. These are the coal conditions in Dalkeith. The illuminating power might be reduced by the drawing in of air; but there is no air admixture at the Dalkeith Gas-Works. Is it possible, then, to get a photometer reading of 15 candles from a gas of 25 candles? If it be, Mr. Hunter should be aware of it; and his knowledge should make him cautious in putting forward his Dalkeith results. If the Gas Company cared, I think they could easily put a stop to the circulation of this accusation against their gas; but possibly their knowledge of the motive upon which it is founded may influence them to take no further notice of the matter. What this motive may be, I cannot say; Mr. Hunter not having disclosed who his "client" is. I observe that the Town Council of Dalkeith have given notice of an intention to apply for a Provisional Order empowering them to supply electric light within the burgh. Could this have anything to do with it? I hope not; for the day is surely past when such a benighted policy as this would be could be expected to work out beneficially to anyone.

I fear that the community of Falkirk are far from being stable in their ways. They speak, at election times, of an "old gang" and a "new gang;" the expressions, as I understand, being descriptive, the former of the party who favour a policy of large schemes, and the latter of the party who may be called "Little Falkirkers." These got into power about three years ago; but such has been the irony of their fate that, during all the days of their continuing in office, they have never been free from the necessity of considering schemes of public service involving large outlays. On their initiation, both new gas-works and new water-works are to be erected. Having received powers for their construction, and reached the point of considering details of the schemes, the community have appeared to turn round, and have refused to return Bailie Cook Rennie to the Town Council; and he accordingly falls out of the position of Convener of the Works Committee of the Gas Commission. Having effected this purpose, and defeated another member of the "new gang," the purpose for which these steps were taken became manifest at a meeting this week, when the subject of the site of the new gas-works was revived. I understood it had been agreed that they were to be erected at a place called Thornhill, outside the burgh. Now, when Bailie Cook Rennie is out of the Council, the proposal is made that they should be built at Parkhouse, a site within the burgh, where the new gasholder is. This site was bored and reported upon; one expert saying it was a bad foundation, and too small, and the other being in favour of it. The suggestion made this week was that the reports of the borers should be laid before the whole Gas Commission. The proposal was quite a fair one, if those reports had not hitherto been before the Commissioners. If they had, there was no need to ask for their production; if they had not, the discussion which took place as to the suitability or otherwise of the Parkhouse site was altogether irregular. This was pointed out; and on the new Convener of the Works Committee (Mr. H. Russell) undertaking to lay everything before the members, and expressing the opinion that, in the matter of site, they should be guided by some engineer of standing, the subject was allowed to drop. The new Convener's view is the one to be commended. The Commissioners have not,

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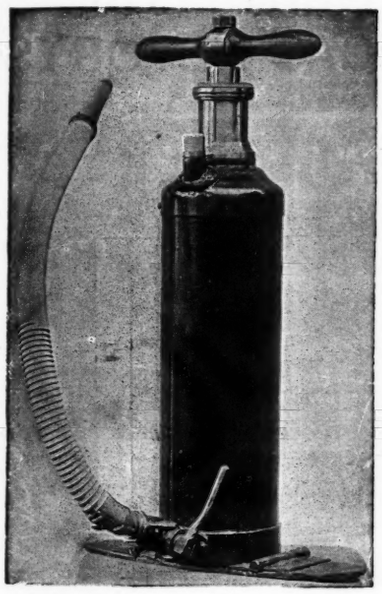

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£3 5s.
Net.
2½ per cent.
Cash Monthly.

Advantages.

This Cleanser is thoroughly effective in removing Stoppages of all kinds, but in practice has been found to be particularly so in cases where Services are choked with Naphthalene.

It is less expensive to Companies, as it overcomes the necessity for repeated operations; and further it reduces the inconvenience to Consumers to a minimum by more thoroughly cleansing the pipes than is done with simply an Air-Blast.

It can, however, be used as an ordinary force-pump, without alteration, by simply omitting the charge.

It is light and compact.

INSTRUCTIONS FOR USE.

Unscrew the plug on the shoulder of the Pump, and pour in a charge of (say) from ¼ to ½ pint of Petroleum Spirit 680-700. Replace the plug, and proceed as with an ordinary Service Cleanser.

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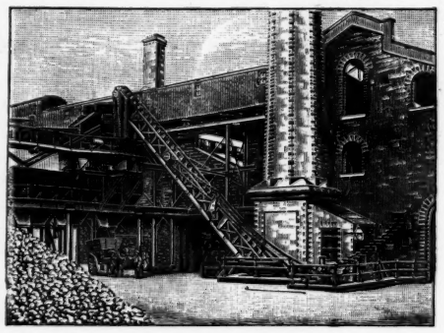
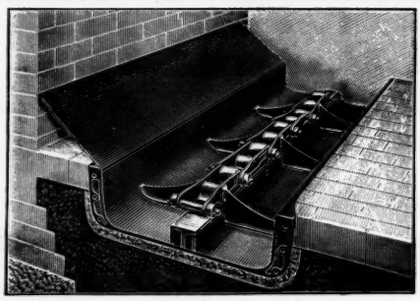


VIEW SHEWING END OF COKE CONVEYOR, ELEVATOR AND CONVEYOR FOR STORING COKE IN HOPPERS AND COKE YARD.

INTERIOR OF RETORT HOUSE SHEWING COKE CONVEYOR.



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GAS AND GENERAL ENGINEERS.

however, gone so far as they have done without advice; and so I suppose what is suggested is that some engineer of outstanding experience should be called in to advise the Commissioners upon the sites, as they can be judged of from the reports which are called for. If this be the course followed, there will then be finality in the matter of site, and progress may be looked for in this great work. Whatever may be the decision, it will, in every sense, be to the advantage of the undertaking if the period of oscillation be past, and the Corporation, having made up their mind, should stick to it. They need be in no doubt as to going in for a most liberal scheme, because the district not only can well afford, but actually requires it.

Matters are not yet in shape in connection with the Greenock Corporation Gas Trust. At a meeting yesterday, Provost Black proposed that the Gas Trust be composed of the whole members of the Board, and that Bailie Campbell be appointed Convener. Mr. M'Callum thought it a good suggestion that the Gas Trust should contain all the members; and this, after discussion, was agreed to. The question of the convenership was then considered. Provost Black said that Mr. Mitchell had been Convener for four years, and it was advisable that a change should be made. He moved that Bailie Campbell be appointed. Bailie Baxter moved an amendment. There had been a great deal of mud thrown at this Committee, and particularly at the Convener, who had not yet had an opportunity of clearing himself. If Mr. Mitchell came out, he would do so under false impressions. He (Bailie Baxter) thought three years a long time to hold a convenership, and he would vote against Mr. Mitchell on this point; but, on the other hand, he should be allowed to justify his position. He moved that Mr. Mitchell be retained as Convener. Mr. M'Callum seconded. Mr. Mitchell said the inference to be drawn from the discussion was that he was considerably responsible for the state of affairs at the gas-works. He wished to say that a Committee of nine members had been appointed to inquire into the muddle; and he asked them if they had found anything which he had done to militate against the Gas Trust. He now wished to try and put himself right if he was Convener—not, however, that he admitted having put matters wrong. Bailie Campbell said he would have remained entirely passive in this matter; and if he consulted his own judgment he would not seek the position. No one doubted the abilities which Mr. Mitchell had shown in his duties as Convener. He himself had always been able to discern that his actions were actuated by the highest motives. He thought that Committees on all important points should have the fullest confidence of the Convener; and when matters were to be decided, the responsibility should be, not on single members, but on the whole Committee. Provost Black said it was quite true that Mr. Mitchell had lost the confidence of his Committee. On a vote being taken, Bailie Campbell was appointed Convener by 13 votes to 8. If ever a change of convenership could be justified, I think it is this one. The appointment of the Collector to be Gas Manager was sufficient to condemn the policy of the Gas Committee.

The Leven (Fife) Gas Company have resolved to increase their stock by £5400 in £1 shares. The existing capital is £3600. The Company are arranging to give a supply of gas to the neighbouring district of Methil, and have entered into contracts for the erection of a new gasholder and tank, at a cost of £5000. For 22 years the Company have paid a dividend at the rate of 10 per cent.; and since 1897 the dividend has been equal to 15 per cent. on the original capital.

The Dundee Town Council are giving notice of a Bill which may have a far-reaching effect upon the gas supply of the city. In view of recent "unseemly" discussions in the newspapers, it has been resolved to insert in the Bill a provision declaring that changes in the price of gas will be for the current financial year. This may or may not be the best way out of the difficulty which has been experienced this year over a retrospective increase in the price of gas; but whether it be or not, it assuredly will not do away with grumbling if, and when, an increase is made retrospective. Then the Corporation are to take authority to lower the illuminating power of the gas; 18 candles being fixed as a minimum. This power, it was explained, may not be exercised. It is wonderful how the desire to have gas of lower illuminating power has spread in Scotland. We are all, to a very large extent, the children of circumstances.

The Carnoustie Burgh Commissioners met on Wednesday to consider the resolutions adopted at the September and October meetings in favour of the adoption of the Burghs Gas Supply Acts. Provost Ramsay said there was an impression abroad that the proposal for the transfer had originated with the Directors of the Gas Company. This was not the case; it had originated entirely in the Commission. Bailie Winter remarked that the original cost of the gas-works was £4000; and they were now valued at £8000. Last year the price charged for gas was 4s. 2d. per 1000 cubic feet; ten years ago it was 5s. 10d. Mr. Soutar said that, so far as he could judge, the feeling in the burgh was in favour of a sale by mutual agreement, instead of arbitration; and he moved that they adjourn the meeting till Feb. 15 next, and that a Committee be appointed to request a conference with the Directors of the Gas Company, and to report. This proposal was unanimously adopted.

There is a strong Socialist element in the community of Aberdeen, which probably explains the boldness of the attitude adopted there by the Gas Workers and Labourers Union. A meeting of the Aberdeen branch of this body was held on Tuesday night, at which a discussion took place upon the manner in which their demands had been treated by the Corporation Gas Committee. About three months ago, it was said, the branch sent a petition to the Gas Committee, asking for an increase of 6d. per shift for night workers, and 2s. per week for day workers, and also dealing with other matters. Their "demands" were not recognized; and at the meeting it was agreed to send the following resolution to the Committee: "Seeing it is now over three months since we, the Aberdeen gas workers, presented a petition to the Gas Committee of the Aberdeen Town Council, we sincerely regret the dilatory manner in which our demands have been dealt with. We express our unanimous determination for these demands being conceded; and we have instructed our Secretary to send a copy of this resolution to the Gas Committee, and demand a reply within fourteen days." It will be observed that on one occasion the application is spoken of as "a petition," but that, in the resolution, it is "a demand." A demand truly, and one which they express their "determination" shall be conceded. Who manages the gas undertaking in Aberdeen? Unless they were sure of strong support in influential quarters, the workers would scarcely dare to address the Corporation in this way.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1258.

Issue.	Share	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p. c.	19—20	..	5 5 0	60,000	5	Sept. 28	7	Ottoman, Ltd. . . .	5—5½	..	6 7 3
100,000	10	,,	7½	Do. 7 p. c.	13—14	..	5 7 2	500,000	100	June 1	6	People's Gas 2nd Mtg. of Chicago Bonds	102—106	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb. .	101—103	..	4 17 1								
200,000	5	Nov. 14	6	Bombay, Ltd. . . .	6—6¼*	+¼	4 13 4	851,070	10	Oct. 12	7	River Plate Ord. . . .	10—10¼	–¼	6 13 4
40,000	5	,,	6	Do. New, £4 paid .	4—4¼*	+¼	5 6 8	250,000	Stk.	June 28	4	Do. 4 p. c. Deb. .	99—101	..	3 19 8
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245—255	..	4 14 1	250,000	10	Sept. 28	8	San Paulo, Ltd. . . .	11—12	..	6 13 4
270,000	,,	,,	9	Do. New . . .	177—182	..	4 18 11	135,000	Stk.	Sept. 14	10	Sheffield A.	234—239	..	4 3 8
50,000	,,	,,	5	Do. 5 p. c. Pref. .	137—142	..	3 10 5	209,720	,,	,,	10	Do. B.	234—239	..	4 3 8
159,375	,,	June 14	4	Do. 4 p. c. Deb. .	116—120	..	3 6 8	447,427	,,	,,	10	Do. C.	232—237	..	4 4 5
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig. .	220—230	..	4 6 11	5,641,885	Stk.	Aug. 15	5⅓	South Metrop., 4 p.c. Ord.	125—128	–2	4 3 3
236,330	,,	,,	7	Do. A. Ord. Stk. .	150—160	..	4 7 6	1,520,000	,,	July 12	3	Do. 3 p. c. Deb. . .	94—97	..	3 1 10
1,009,500	Stk.	Aug. 29	5	Bristol, 5 p. c. max. .	117—118	..	4 4 9	380,940	Stk.	Nov. 14	5	Southampton Ord. . . .	107—112*	..	4 9 3
420,000	20	Sept. 28	10	British	38—40	+1	5 0 0	70,825	,,	July 12	4	Do. 4 p.c. Deb.	117—122	..	3 5 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p. c. .	24—26	..	4 12 4	120,000	Stk.	Aug. 30	6	Tottenham A. 5 p.c.	112—117	..	5 2 7
70,000	10	,,	9	Do. 7 p. c. . . .	19—21	..	4 5 8	250,520	,,	,,	4½	and B. 3½ p.c.	80—85	..	5 5 11
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	8—8¼	–¼	7 1 2	61,550	,,	June 14	4	Edmonton 4 p. c. Deb.	111—115	..	3 9 7
220,000	Stk.	June 14	4	Do. 4 p. c. Deb. .	98—100	..	4 0 0	182,380	10	Jan. 12	5	Tuscan, Ltd.	7—8	..	6 5 0
150,000	20	July 12	8½	Cagliari, Ltd. . . .	23—25	..	6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98—102	..	4 18 0
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	13½—14½	..	5 10 4								
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55*	..	5 9 1								
550,000	Stk.	Oct. 12	12¾	Commercial Old Stock .	265—275	..	4 12 8								
236,425	,,	,,	9¾	Do. New do. .	200—210	..	4 12 10								
288,237	,,	June 14	4½	Do. 4½ p. c. Deb. .	133—138	..	3 5 8					WATER COMPANIES.			
800,000	Stk.	May 31	9	Continental Union, Ltd.	175—180	..	5 0 0								
200,000	,,	,,	7	Do. 7 p. c. Pref. .	168—173	–2	4 0 11	780,404	Stk.	June 28	11	Chelsea, Ord.	303—308	..	3 11 5
51,600	Stk.	—	14	Croydon A 10 p. c. . .	—	..	—	150,000	,,	,,	5	Do. 5 p. c. Pref. .	157—162	..	3 1 9
178,400	,,	—	11	Do. B 7 p. c. . .	—	..	—	160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	143—148	..	3 0 10
555,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p.c.	117—122	..	4 6 1	175,785	,,	Sept. 28	4½	Do. 4½ p. c. Deb. .	143—148	..	3 0 10
60,000	,,	,,	5	Do. 5 p. c. Pref. .	130—135	..	3 14 1	1,720,560	Stk.	Oct. 12	7	East London, Ord. . . .	198—198	..	3 10 8
486,090	10	July 27	11	European, Ltd.	19—20	..	5 10 0	654,740	,,	June 14	4½	Do. 4½ p. c. Deb. .	147—152	..	2 19 3
354,060	10	,,	11	Do. £7 10s. paid .	14—15	..	5 10 0	797,687	,,	,,	3	Do. 3 p. c. Deb. .	98—100	..	3 0 0
14,993,075	Stk.	Aug. 15	4 4/6	Gas- 4 p. c. Ord. . .	96—98	–2	4 9 9	700,000	50	June 14	8†	Grand 10 p. c. max. .	110—113	..	3 10 10
2,600,000	,,	,,	3½	light 3½ p. c. max. .	92—94	..	3 14 6	810,000	Stk.	Sept. 28	4	Junction 4 p. c. Deb. .	130—135	..	2 19 3
3,799,735	,,	,,	4	and 4 p. c. Con. Pref.	114—117	..	3 8 5	708,000	Stk.	Aug. 30	14	Kent	300—305	..	4 11 10
3,993,975	,,	June 14	3	Coke 3 p. c. Con. Deb.	94—96	..	3 2 6	160,000	,,	,,	7	Do. New, 7 p. c. max. .	200—210	..	3 6 8
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13—14*	..	5 14 4	1,043,800	100	June 28	10½	Lambeth, 10 p. c. max. .	298—298	..	3 10 6
3,800,000	Stk.	Nov. 14	10	Imperial Continental .	201—206*	–1	4 17 1	406,200	100	,,	8	Do. 7½ p. c. max. .	205—210	..	3 16 2
478,600	Stk.	Aug. 15	8½	Do. 8½ p. c. Deb. Red.	100—102	..	3 8 8	350,000	Stk.	Sept. 28	4	Do. 4 p. c. Deb. .	127—130	..	3 1 7
75,000	5	June 14	6	Malta & Medn., Ltd. .	4⅝—5⅛	..	5 14 5	500,000	100	Aug. 15	14	New River, New Shares	407—412	..	3 8 0
560,000	100	Oct. 1	5	Met. of 5 p. c. Deb.	105—108	..	4 12 7	1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb. .	128—133	..	3 0 2
250,000	100	,,	4½	Melbourne 4½ p. c. Deb.	104—106	..	4 4 11	902,300	Stk.	June 14	7½	South- Ord. . . .	203—208	..	3 12 1
541,920	20	Nov. 14	3½	Monte Video, Ltd. . .	10—11*	..	6 7 4	126,500	100	,,	7½	wark 7½ p. c. max. .	188—193	..	3 17 9
667,946	Stk.	Aug. 30	9½	Newc'tle & Gatesh'd Con.	210—215	..	4 6 1	489,200	Stk.	,,	5	and 5 p. c. Pref.	155—160	..	3 2 6
299,855	Stk.	June 28	3½	Do. 3½ p. c. Deb. .	104—107	..	3 5 5	1,019,585	,,	Oct. 12	4	Vauxhall 4 p. c. A Deb.	128—133	..	3 0 2
150,000	5	May 16	8	Oriental, Ltd. . . .	7—7½	..	5 6 8	1,155,066	Stk.	June 14	10	West Middlesex . . .	278—283	..	3 10 8
135,000	5	,,	8	Dc. New, £4 10s. pd.	5⅞—6⅛	..	5 15 3	200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	140—145	..	3 2 1
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1½	..	4 11 5	200,000	,,	Sept. 14	8	Do. 8 p. c. Deb .	97—99	..	3 0 7
					*Ex. div.								*Ex div.		

† Next dividend will be at this rate.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 17.

Sulphate of Ammonia.—There has been a firm market throughout the week; and, although prices have been somewhat irregular, values have improved—the closing quotations being £10 15s. to £10 17s. 6d. per ton f.o.b. at the ports. Consumers have been slow to follow the advance, and have done only a small proportion of the business, the bulk having again been taken for "covering" purposes. Scotch makers, being already well sold for the month, have been very firm; but elsewhere makers have offered their production freely. Direct inquiry has been mainly for delivery ahead; but, so far, buyers have for the most part declined to pay the prices required. There has, however, been speculative buying over the spring months at £11 5s. per ton, and at the close £11 7s. 6d. is required, ordinary terms. London, Beckton terms, has also been advanced to £11 7s. 6d. per ton in the same position.

Nitrate of Soda is quiet but steady at 8s. 4½d. to 8s. 6d. per cwt., according to quality, on spot.

LONDON, *Nov.* 17.

Tar Products.—The position, generally speaking, is not of an encouraging nature; the tendency being to lower prices. Many distillers are now bewailing the excessive prices paid for tar a few months ago; and, in one instance at least, serious consequences have resulted. Pitch is moving off freely, but, in sympathy with coal and other fuels, is easier in value. Carbolic acid is a little stronger perhaps, although the quotations vary somewhat, having regard to the port of shipment and the position of makers. Benzol is steady. Creosote is weak. Naphthalene continues in good inquiry. Anthracene is in slightly better request; but quoted prices are only nominal, as very little business is being done.

The average values during the week are: Tar, 15s. to 21s. Pitch, east coast, 34s. 6d.; west coast, 31s. 6d. Benzol, 90's, 10½d. to 1s. 0½d.; 50's, 1s. 1½d. Toluol, 1s. 3d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. Creosote, 2d. Heavy oils, 2⅝d. Carbolic acid, 60's, 2s. 7d. Naphthalene, 85s.; salts, 65s. Anthracene, nominal, "A," 3¾d.; "B," 2¼d.

Sulphate of Ammonia is firmer, with a good deal of inquiry; important business being reported for prompt and forward delivery at an average value at all ports of about £10 15s. per ton, less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The question of prices has again been under the consideration of Lancashire coalowners during the past week; and the present list basis has been practically confirmed. Competition from outside districts, however, continues very keen; and one or two important Lancashire markets—such as Oldham and Rochdale—are being so vigorously attacked that consumers there are obtaining a large proportion of their supplies from Yorkshire, Derbyshire, or Staffordshire, at prices under the quotations of local collieries. Lancashire coalowners, however, appear to be satisfied with their position; and as they are not accumulating stocks of any great weight, they see no reason why they should reduce prices with the object of securing more business. But in some of the more far-seeing quarters, rather a bad time for Lancashire collieries is being looked forward to in the not very distant future, unless some early steps are taken to meet the growing outside competition. The better qualities of round coal are not just now in more than limited request; and stocks are increasing, though they are still far below the average for the time of the year. Common round coals are in fair inland demand for steam and forge purposes; but the shipping trade has fallen off decidedly, and this class of fuel is becoming more plentiful on the market. Current prices for all descriptions of round coal are being well maintained on the basis of about 16s. 6d. to 17s. 6d. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, and 14s. to 14s. 6d. for common house coal. There is, however, little doubt that in many cases collieries would be disposed to entertain forward contracts at some reduction on present prices; but there is no great eagerness on the part of either merchants or large users to enter into any heavy forward engagements. As to engine fuel, supplies of the commoner sorts of slack continue plentiful, and are offered at very low figures; but the better sorts are fairly well maintaining late rates, and Lancashire collieries state that the position is rather improved than otherwise, owing to the larger requirements in the cotton trade now that the mills are again getting into work. At the pit, the Association list basis remains at about 10s. to 10s. 6d. per ton for the best qualities of slack; but important forward contracts have been settled during the past week, at about 9s. to 9s. 3d. For shipment, prices are easier; the commoner sorts of steam coal being obtainable at about 15s. 3d. to 15s. 6d. per ton, while the best qualities are to be bought at 15s. 9d. to 16s., delivered at Mersey ports.

Northern Coal Trade.—There is a steadier demand in the coal trade of the North; but the supply is fully adequate, and prices in some cases are a little weaker. In the steam coal trade, this is marked; and best Northumbrian steam coals are from 16s. 3d. to 16s. 6d. per ton f.o.b., second-class steams about 9d. lower, and steam smalls 8s. 6d. per ton. In the gas coal trade, there is now a very heavy delivery on the long contracts; and the quantities that have been sent out of late must have enabled the large consumers to accumulate considerable stocks. The supply of gas coals is not so limited as usual; but the contracts take up the bulk of the production. For odd cargoes, 16s. 3d. to 16s. 6d. per ton f.o.b. is now the current quotation. In coke, there has been a reduction of the output, which has steadied prices. Best Durham coke for export is quoted from 23s. to 24s. per ton f.o.b.; and blast-furnace coke is about 22s. at the furnaces. Gas coke is now in larger supply; but so far the production seems well taken up, and the price that is quoted is still from 24s. to 25s. per ton f.o.b., though contracts run at lower prices.

Scotch Coal Trade.—Trade is wavering. It is said by those who speak in its name, that it showed signs of weakness for about a week, but is now firming up again; that the reduced prices had brought out the orders which had been held up; and that the position is improving. On the other hand, prices are still on the decline; and those who are outside the

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trade see no indication of them firming up. The quotations are: Main 13s. to 13s. 6d. per ton f.o.b. Glasgow, ell 14s. to 15s., and splint 15s. 6d. to 16s. The shipments for the week amounted to 195,657 tons—a decrease of 24,687 tons upon the previous week, but an increase of 61,623 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,573,407 tons—an increase of 1,928,280 tons upon the corresponding period of last year.

Reduction in the Price of Gas at Penistone.—Like most other suppliers of gas, the Penistone Gas Company a few months ago were compelled to raise their price to the extent of 7d. per 1000 cubic feet. They have now notified their intention of taking the first step in the direction of a return to the old figure (4s. 2d.), by making a reduction of 3d. from the commencement of 1901.

Abandonment of the Water-Gas Project at Darlington.—In view of the resolution passed at the meeting of ratepayers held at Darlington on the 8th inst., objecting to water gas (*ante*, p. 1232), the Town Council have not confirmed the report of the Gas Committee recommending the introduction of plant for the manufacture of this gas. The Committee had made a thorough inspection of the different systems, and had accepted the tender of the Economical Gas Apparatus Construction Company, for plant equal to the production of 600,000 cubic feet per diem; but, as the result of the above-mentioned proceedings, the firm have lost it.

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards offered for sale, by order of the Directors, £30,000 of new ordinary stock of the Wandsworth and Putney Gas Company (being part of the additional capital authorized by the Company's Act of last session), ranking for a standard dividend of 3½ per cent., subject to the sliding-scale, and entitled, under the present price charged for gas, to a dividend of £5 1s. 6d. per cent. Purchasers were found for £28,400 of the stock; the prices realized being £100, £101, £102, and £103 (one lot) per cent. At Leamington, last Thursday, Mr. J. A. Locke sold some £20 "A" shares in the Leamington Priors Gas Company at £47 12s. 3d., £48 6s. 3d., and £48 apiece; some "B" shares in the Company fetching £36 and £36 1s. 3d. each. On the same day, Mr. C. Maude offered for sale at Northallerton, 14 fully-paid shares in the Northallerton Consumers' Gas Company. The first three £5 shares were sold for £8 2s. 6d. each, while the remainder fetched an average of £8 2s. 6d. per share. On Thursday, Messrs. Day and Son disposed of £4000 of ordinary stock and £225 of 3 per cent. debenture stock in the Maidstone Gas Company. Fifteen £100 lots of ordinary consolidated stock realized from £198 10s. to £200 each; forty £50 lots, from £99 to £100 each; and 26 £25 lots, from £49 10s. to £49 15s. apiece. Fifteen £100 lots of debenture stock realized £75 each; fourteen £50 lots, £37 10s. apiece; and one £51 lot, £39. Last Tuesday, some 7 per cent. shares in the Coatbridge Gas Company were offered for sale by auction at Coatbridge, in lots of 10. One lot realized at the rate of £14 11s. per share; four lots, at £14 10s. 6d.; 23 lots, at £14 10s.; 10 lots, at £14 9s. 6d.; and one lot of eight shares, at £14 11s. 6d.

Public Control of Sources of Water.—At a recent meeting of the Warwickshire County Council, the Sanitary Committee presented for consideration a scheme for the amendment of the law as affecting sources of water supply prepared by the County Councils Association. The proposals are: (1) The Local Government Board to have the power, on the application of the council or councils of one or more counties or county boroughs, after due inquiry held on that behalf, to (*a*) constitute an authority for the purposes hereafter mentioned; and (*b*) to define the area within which such authority shall exercise its powers and functions—the authority to include, in such proportions as may be agreed upon, or as the Local Government Board may determine, members elected by administrative counties, county boroughs, and non-county boroughs situate within the area. Urban district councils or rural district councils within the area may be represented either directly or indirectly by their representatives on the county council. (2) They will be powers and functions of authority to promote and oppose Bills; to levy rates and raise loans under proper safeguards; to enforce the Rivers Pollution Prevention Acts; to protect sources of water supply in the area; to create water districts; and to ensure any locality within the area being supplied at reasonable rates by any authority or company taking water for sale from within the area. The power of the authority to execute works or to undertake the supply or distribution of water to be excluded in terms. All existing undertakings, it is suggested should be saved from interference by the authority. The matter was referred to a Sub-Committee of the County Council.

Lambeth Water-Works Company.—The report of the Directors for the half year ended Sept. 30 states that during that period 2239 houses and other supplies of water, estimated to yield an annual rental of £4934 15s., were connected with the Company's works, as compared with 2406 houses, &c., producing a rental of £5580 9s., laid on in the six summer months of 1899. The revenue account, compared with the corresponding period of last year, exhibits an increase of £3744 in the water-rents, &c., and of £3661 in the ordinary expenditure. The surplus transferred from the revenue to the dividend and interest account is £88,670. There is to the credit of the latter account, after payment of interest on the debenture stock, and the Company's contribution towards the cost of works of intercommunication, an available balance of £83,849. The Directors have decided to transfer the sum of £3000 to the contingency fund (which will then stand at £43,000). They recommend that a dividend at the prescribed rate of 7½ per cent. per annum be paid on the shares issued under the Act of 1856; that a dividend at the prescribed rate of 10 per cent. per annum be paid on all the other share capital; and that a payment of 5s. per cent. (being at the rate of ½ per cent. per annum) be made on all the share capital of the Company on account of deficiencies of previous dividends—all less income-tax. A balance of £5966 will remain to be carried forward, after making provision for a payment of £1875 to the Chamberlain of the City of London under the sinking fund clause of the Company's Act of 1886, in respect of debenture stock issued under that Act; and a further sum of £1960, which will shortly become payable to the Chamberlain in respect of the first issue of debenture stock under the Act of 1896.

CARBURETTED WATER-GAS APPARATUS

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BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

Bursting of a Tar-Main at Blackburn.—Last Thursday, consternation was caused in Cardwell Place, Blackburn, by the bursting of a large main, used for carrying tar from the gas-works to a chemical-works, some distance away. The surface of the street was forced up, and smoking jets of tar rose in the air, flooding the street and emitting a very disagreeable stench. Traffic was quickly stopped, and the main shut off. No personal injury was sustained.

Proposed Extension of the Halifax Corporation Gas Supply.—At the last meeting of the Halifax Town Council, the Town Clerk was instructed to make application to the Local Government Board for a Provisional Order empowering the Corporation to purchase from the Sowerby Bridge District Council their gas undertakings in the Skircoat and Warley districts for £9181, and the interests of the Elland-cum-Greetland Gas Company in Skircoat for £1100.

Sudbury Town Council and Oil Lighting.—At the meeting of the Sudbury Town Council last Tuesday, the subject of the lighting of the Wents by oil was referred to, on the order for the payment of the contractor's bill, amounting to £1 15s. 6d. for lamps, &c., and 17s. 6d. per week for cleaning, lighting, trimming, supplying the oil, and keeping in repair. A member remarked that this was cheaper than gas. Alderman Mauldon called attention to a remark made by Mr. Constable at the last quarterly meeting of the Council, to the effect that by the adoption of oil lighting at the Wents they were "putting the clock back fifty years," and pointed out that in Paris gas was being superseded by oil. The squares and promenades, including the Bois de Boulogne, were very shortly to be illuminated by petroleum. The Mayor (Mr. F. Wheeler) said that the incandescent oil light was the most powerful one in use, and was being largely adopted for private houses. Mr. Constable added that in some places people were going back from electricity to gas.

Mr. Justice Bigham on the Welsh Coal Trade.—Mr. Justice Bigham, in opening the commission of the Glamorganshire Assizes at Swansea, last Thursday, referred to the Welsh colliers' stop-day. He said the proposal, as he understood it, was to limit labour with the object of restricting the output of coal, and by this means maintain or increase the high rates of wages. It was not for him, sitting there as Judge, to deliver a lecture upon political economy. Men were entitled in this country to manage their business as they thought fit. Working men who had their labour to dispose of were clearly justified in using all lawful means to get the best price they could for it. Whether abstaining from work was likely to secure a desirable result it was for the men themselves to consider. But his long experience, not only on the Bench but in business, told him that to attempt to control the laws of supply and demand only recoiled upon those who made the attempts. It was like trying to sweep back the sea with a broom. If they worked at this job long enough, the tide in the end would drown them. Better work with the tide than against it. When one remembered how every foreign country and our own Colonies were competing, it must be evident that every day, every hour, that South Wales ceased to produce its wealth, they put into the pockets of the stranger profits which workmen and capitalists in that part of the world ought to be making for themselves.

Birkdale and the Purchase of the Southport Water-Works.—Last Tuesday, the Birkdale District Council resolved to join the Southport Corporation and the West Lancashire Rural District Council in promoting a Bill in Parliament to form a Water Board, to acquire and purchase the undertaking of the Southport Water Company.

Dunedin Suburban Gas Company, Limited.—The report of this Company for the year ended the 30th of June, states that the balance to the credit of the profit and loss account amounted to £1058; making, with the balance brought forward, £1314. The Directors propose to distribute a dividend at the rate of 1¾ per cent. per annum, and to place £400 to the reserve, which will then stand at £1600. There will remain a balance of £267.

Town Councillors and Contracts.—At the last meeting of the Bolton Town Council, Alderman Miles asked to be allowed to intervene in the ordinary business in order to move the following resolution: "That a Committee be appointed to consider and report upon the position of members of the Council having interest in contracts with the Corporation, either through a registered company or otherwise; and that the Committee consist of the following members of the Council: The Mayor, the Deputy-Mayor, and Councillors Bailey, Fielding, J. T. Cooper, Flitcroft, and Greenhalgh." He remarked that the matter had been recently discussed at a private meeting; and he said he thoroughly and heartily agreed with the appointment of a Committee for the purpose specified. The motion was agreed to.

Gas Exhibition at the Drill Hall, Bristol.—In the "JOURNAL" for the 18th of September, we gave a full account of the opening of a gas and general illuminating exhibition which Mr. T. G. S. Hersey, one of the organizers of the successful display at the Royal Aquarium early in the year, had arranged in Manchester; this being the first of a series to be held in various parts of the country. On Monday last week, a similar exhibition was inaugurated in the Drill Hall, Bristol; and it will remain open till the 6th prox. The special exhibits comprise gas cooking, heating, and lighting appliances by the well-known makers, gas plant, models and photographs, &c., the others being of a more general character. Various miscellaneous attractions have been provided which will tend to make the exhibition popular. An excellent selection of music is supplied by the band of the 7th (Princess Royal's) Dragoon Guards.

General Gas Company of France.—The report of this Company for the twelve months ending June 30 shows that the result of the working in that period was a sum of 3,134,037 frs. (£125,361), as compared with 3,028,566 frs. (£121,142) in the preceding year. Adding the balance brought forward (451,585 frs.), there was a total of 3,585,622 frs. (£143,425). Deducting the general expenses, the amount required to pay the interest on the bonds, the Directors' fees, and other charges, there was left a disposable balance of 1,146,957 frs. (£45,878). At the recent meeting of shareholders, the Directors recommended that 300,000 frs. should be distributed at the rate of 7 frs. 50 c. per share; and that the balance of 846,957 frs. should be carried forward, as compared with 451,585 frs. last year. This was agreed to. The dividend declared was 32 frs. 50 c. per share—the same as before; and the reserve fund was increased to 1,539,223 frs. (£61,569).

OUR
STAND
AT
MANCHESTER
EXHIBITION.

LONDON,
WARRINGTON,
STRATFORD,
PLYMOUTH,
DUBLIN,
BOURNEMOUTH.

The Mildenhall Gas Company, Limited, has been registered with a capital of £1635, in £5 shares, to take over the business of the Mildenhall Gas Company, constituted by Deed of Settlement in 1843.

Price of Gas in London.—At the usual fortnightly meeting of the Court of Common Council of the City of London last Thursday, the Lord Mayor laid before the Court resolutions from the Gas Consumers' Protection League, protesting against "the exorbitant charges for gas by the Gaslight and Coke Company." On being read, the communication was unanimously referred to the Streets Committee.

New Water Scheme for Barrow.—The Barrow Town Council, at a meeting held recently, considered recommendations of the Gas and Water Committee that powers be sought to obtain water from the River Duddon, and that Mr. Mansergh be retained to support the scheme in Parliament. The scheme provides for tapping the Duddon on its upper reach, and raising the level of Slathwaite Tarn by means of an embankment, so that the River Duddon will never be very much interfered with, as the waters of the Tarn flow into it. The cost of the scheme was stated to be about £150,000. The recommendations were agreed to.

Aldeburgh Corporation and the Water-Works.—At the last meeting of the Aldeburgh Town Council, a letter received from the Local Government Board on the proposed acquisition of the water-works, and a motion to make application to the Board for their sanction to the borrowing of £5000 for the purpose, to be repaid within 30 and 15 years respectively from the date of borrowing, were under consideration. The Town Clerk (Mr. H. C. Casley) read the letter, which had already been before the Council; and with regard to the other matter, the Mayor (Mr. G. H. Garrett) explained the position in which the whole matter stood. After some discussion, it was unanimously resolved that the Council should, in the ensuing session, promote a Bill authorizing and confirming the purchase, under the provisional contract already sanctioned by the Local Government Board, of the undertaking of the Water Company; and that the Mayor should be requested to convene a statutory meeting of the Council to sanction this step.

Wath-upon-Dearne Water Supply.—Mr. W. A. Ducat, one of the Local Government Board Inspectors, held an inquiry at Wath-upon-Dearne, on Nov. 6, in regard to an application of the Urban District Council for sanction to borrow £3000 for the purpose of a water undertaking, including an improved supply to a portion of the parish of Brampton Bierlow, which, though not in the urban district, is within the area of supply. The scheme for which the money is required includes the provision of a storage reservoir capable of holding 175,000 gallons, at the highest point in the district; the object being to improve the supply to an area of 200 houses and about 1000 inhabitants which has hitherto been indifferently served. In the event of any accident occurring to the works of the Dearne Valley Water Company, who, under agreement, furnish the greater quantity of water consumed in the Wath district, the new reservoir will be capable of supplying the entire district for two days. The Wath water undertaking was formerly the property of the West Melton Water Company, and was acquired by the Council nearly three years ago; the purchase money being £13,250.

Schemes of Water Supply for the Shifnal District.—At their last monthly meeting, the Shifnal Rural District Council had before them a report prepared by their Sanitary Committee on the water supply of the district. They presented a series of plans with an estimate of £4984 for supplying the parish of Shifnal with water, and decided to submit them for the approval of the Local Government Board, and to apply for sanction to borrow £5000 to carry out the scheme. The work will include a supply to The Wyke and the village of Haughton. A scheme for supplying the parish of Kemberton with water was also adopted. The estimate was for £957; and it was decided to borrow £1000 for carrying out the work.

Investigating London Fogs by Balloon.—The Rev. John M. Bacon, whose article on "Fogs and their Teaching" was noticed in the "JOURNAL" for April 24 last, writes to the papers from Coldash, Newbury, as follows: "I am arranging to have a balloon, captive or otherwise, at my service to explore and investigate scientifically the higher limits and constitution of any dense London fog that may shortly occur; and I beg to invite scientific friends to suggest various ways in which the most useful work may be done. I should much like to fire a harmless charge of guncotton in space beyond the fog (similar to those which I have twice already fired harmlessly enough over London for acoustical purposes), so as to be able to note if the wave of explosion is followed by any dislodgment and dispersal of the fog."

Leaky Water-Pipes as Land Drains.—A correspondent lately wrote to the "Engineer" as follows: "The Local Government Board recently issued, for the guidance of sanitary authorities and their officers, a 'General Memorandum on the Proceedings which are Advisable when Attacked or Threatened by Epidemic Disease,' and in paragraph 5, which deals with water supply, the following occurs: 'The liability of leaky water-pipes to act as land drains, and to receive foul matters as well as land drainage through their leaks, is not to be overlooked; and such pipes running full of water with considerable velocity are liable to receive, by lateral induction at their points of leakage, external matters that may be dangerous. This latter fact is not recognized so generally as it should be; and ignorance of it has probably baffled many inquiries in cases where water services have in truth been the means of spreading disease.' May I ask if you, or any of your readers who are interested in towns' water supply, have ever come across a case such as is here described? My own experience with both leaky mains and service-pipes under varying conditions has so far been that the leaks have always been a source of waste of water; and I have never found one in which the supply was augmented by the injector-like action described in the circular quoted. Were the pressure shut off, one could understand liquids, under certain conditions, finding their way into faulty pipes or joints, or down through ball-valve hydrants; but this, of course, is quite another matter." The Editor of the "Engineer" remarked upon the subject of this letter as follows: "Theoretically the action described is possible. If the water in the pipe moved at a sufficient velocity, it would certainly take place; but it never does so move. We have never heard of a case in practice, and fancy that someone with imperfect knowledge of the subject has elaborated the theory out of his own internal consciousness."

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SULPHATE OF AMMONIA PLANTS.

Rejection of the Falmouth Water-Works Purchase Scheme.—The ratepayers of Falmouth have emphatically pronounced against the scheme for the purchase of the undertaking of the Falmouth Water Company. The votes taken in the poll which followed the recent town's meeting were counted last week, with the result that, while 348 were found to be in favour of purchasing the undertaking, 1620 were opposed to it. Of 2528 papers issued, 1662 were correctly filled in; the remainder being blank, spoiled, or undelivered. In face of the large majority of more than four to one who have voted against it, it is unlikely that anything more will be heard of the proposals for municipalizing the water-works which have been discussed for several years past.

The Ironmongers' Federated Associations and Municipal Trading.—At the autumnal conference of the Ironmongers' Federated Associations held recently at the Holborn Restaurant—the President (Mr. J. N. Greenall, of Nottingham) in the chair—a discussion took place on a statement made by Mr. Smith, the General Secretary, in his evidence before the Joint Committee on Municipal Trading, and it was resolved: "That this conference, having heard the evidence given by their Secretary on the subject of municipal trading before the Joint Committee of the Houses of Lords and Commons, heartily approves the same, and strongly opposes any additional powers being granted to municipal bodies, and condemns the principle of employing the ratepayers' money in competition with private traders."

Damage to Gas and Water Pipes by a Sewer Explosion.—About half-past eight last Thursday evening, residents in Smeed Road, Hackney Wick, and contiguous streets, were alarmed by a loud explosion followed by the upheaval of the roadway in the thoroughfare named, extending for many yards. A strong odour of gas suggested some accident to the gas-main; but the real cause of the disturbance was the bursting of a brick sewer, through an extraordinary accumulation of foul air, generated, it is supposed, by the discharge from numerous chemical and other works in the neighbourhood. As expeditiously as possible, the authorities were summoned, and a gang of men was soon at work repairing the damage. Not only had the gas-main been sprung, but leakages were found in the water-pipes, which caused some trouble. Fortunately there were no personal injuries through the explosion.

The Dorking District Council and the Water-Works.—In response to a requisition signed by ratepayers and owners resident within the urban district of Dorking, a specially convened meeting was held on Thursday evening for the purpose of formally passing a resolution in support of the Urban District Council's decision to promote a Bill next session to acquire the undertaking of the Dorking Water Company, in pursuance of the resolution passed by the Council on the 11th ult. (*ante*, p. 974). Mr. J. W. Palmer (Chairman of the Council) presided, and moved the resolution, and urged its adoption on the ground of the advisability of all such undertakings being in the hands of the local authorities. Mr. Clift seconded the motion. Mr. Jeal, one of the Directors of the Company, spoke in opposition to the proposal; arguing that the present was not a suitable time to promote the purchase. Mr. Cook agreed with the last speaker; remarking that the increase in the rates would amount to about 9d. in the pound. He calculated that the cost of purchase would be as much as £50,580, and estimated the expense of the promotion of a Bill at another £5000. After further remarks for and against the motion, the Chairman replied, and pointed out that if the present opportunity were allowed to slip, and the Council had to commence *de novo*, they would have to contend with the full force of the Water Company's opposition. The resolution was then put, and lost by an overwhelming majority. Mr. Clift gave notice of a poll, which the Chairman said would be taken in due course.

Margate Water Supply.—The Borough Engineer of Margate (Mr. A. Latham, M.Inst.C.E.) lately presented to the Water Committee of the Corporation an exhaustive report on the water supply of the town. Their present need amounted, he said, to 1,225,000 gallons daily. The utmost they could safely depend upon from the Dane and Tivoli works combined was 650,000 gallons; leaving a deficiency of 575,000 gallons. If the resident population of Margate increased in the same proportion as of late, in about twenty years' time the consumption of water would have risen to 2,000,000 gallons daily; and if the old works were then retained, they would require an increased supply of 1,350,000 gallons per diem. If the old works were abandoned, the new supply must be capable of yielding 2,000,000 gallons daily. He was of opinion that while the site of the proposed works should be equal to the full demands which might be made in the future, the transition should be gradual. A present increased supply of 1,000,000 gallons in 12 hours, with an elastic plant, would make them quite independent of either of the old stations, but not of both, and meet all demands for years to come; but the site should be capable of furnishing the 2,000,000 gallons when required. He thought the district of Wingham presented very favourable conditions for procuring an abundance of good water, if drawn above any source of impurity. He presented an estimate for the scheme, amounting to £90,829, which would mean an annual cost of £5369 2s. 6d. At a recent meeting of the Town Council, a report was received from Messrs. Charles Hawksley, E. M. Eaton, and W. Whitaker on the scheme. They stated that they had, in conjunction with the Engineer, visited Wingham, and considered the scheme would afford "a good and ample supply of water, admirable in quality, and sufficient in quantity to meet the growing demands of Margate for many years to come." They were also of opinion that the Bill to be promoted by the Corporation to enable them to carry it out should contain powers to raise money for making ordinary extensions of pipes and other works chargeable to capital, for a long period; and they recommended that the borrowing powers be fixed at a sum of not less than £150,000. It was decided, with one dissentient, that a Bill should be promoted next session.

Mr. Oswald Turner, after 55 years' service, Mr. Charles Westoby, after 35 years' service, and Mr. William Horsfall, after 31 years' service, have resigned their positions as collectors in the Gas Department of the Manchester Corporation. They were recently recipients, at the hands of Alderman Gibson, Chairman, of illuminated copies of a resolution passed by the Gas Committee, expressing appreciation of their labours, and thanks for their faithful performance of duty.

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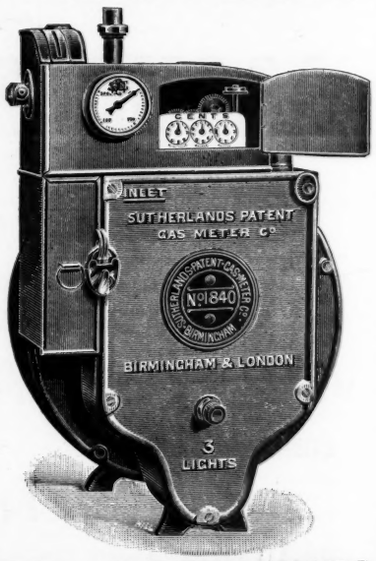

THE SUTHERLAND GAS-METER COMPANY

ESSEX WORKS, BIRMINGHAM.

The Cuckfield Rural District Council have resolved to apply for a loan of £11,000 for water-works and the extension of mains.

Calculated on the present output of coal, a rise of 1d. per ton represents nearly an additional million of money to the coal-owners.

At the meeting of the Wigton District Council last Tuesday, it was stated that the estimated cost of the trunk main, headworks, &c., of the Overwater and Head of Ellen water scheme was £40,000.

Mr. Wharram, who has been Deputy-Chairman of the Hull Corporation Gas and Water Committee for some years, has been selected to succeed Alderman Massey as Chairman, that gentleman having resigned the position.

Subject to audit, the Directors of the Grand Junction Water-Works Company will recommend a dividend on the 10 per cent. maximum ordinary shares of the Company at the rate of 8 per cent. per annum for the half year ended the 30th of September.

At a meeting of the Coventry Gas Fittings, Electrical, and Engineering Company yesterday week, resolutions were proposed in favour of a reconstruction of the Company; and it was decided that it be wound up voluntarily, with Mr. T. M. Daffern as Liquidator. A new Company is to be formed, to be called the New Coventry Gas Fittings and Electrical Engineering Company.

The Directors of the Continental Union Gas Company, Limited, have decided to recommend to the proprietors, at the forthcoming general meeting, to be held on the 11th prox., dividends of 5 per cent. for the half year on the ordinary stock, free of income-tax, and 3½ per cent. for the half year on the preference stock, less income-tax; making 9 and 7 per cent. respectively for the year.

In the course of the demolition of the gasholder in the old town gas-works at Mayence, a large bale of cloth, well preserved, and a great number of French bayonets and chassepot rifles were found between the inner and outer lifts. These relics of the Franco-Prussian War must have been in their resting-place for at least thirty years.

The East Surrey Water Company announce, in another part of the "JOURNAL," particulars of a sale by tender of not exceeding 1500 of ordinary "B" shares of £10 each, in lots of ten, entitled to a dividend of not more than 7 per cent. per annum, which has been the rate declared for the past two years. The minimum price is £16 per share; and successful applicants will be allowed till Jan. 8 to complete the purchase.

A 2000-candle power Kitson light has been placed at the north end of South Avenue, Darlington; and according to a local paper, it is probably the most powerful light it has yet had. It sheds "a dazzling brightness." We question whether it gives, as the writer says, "a certain ghastliness to the scene;" but we quite believe that "if you look at the light and then turn round and look at the moon, the moon seems completely in the shade," and that "the common or garden gas-lamps are nowhere."

In the "JOURNAL" for the 9th ult., it was briefly recorded that the export of sulphate of ammonia from the United Kingdom had decreased to Germany about 3593 tons. We may supplement those figures by others showing a falling off to France, 5917 tons; to Belgium, 5046 tons; and to Holland, 1749 tons. Other countries, however—for example, Spain and the United States—show an increase in the imports from the United Kingdom. In Germany the consumption has increased, and the demand is supplied by the home production. The British import comes in principally *viâ* Hamburg, and during the last years has averaged £150,000. The greatest part of this remains in Hamburg; a small quantity goes inland *viâ* rail, or by ships on the Upper Elbe.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

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[For Illustrated Advertisement see Nov. 6, p. 1174.]

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A. NICHOLSON,
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Oldham, Nov. 14, 1900.

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Tenders, addressed to the undersigned, to be delivered not later than Friday, the 30th inst.

W. HARDIE,
Engineer and Manager.

Gas-Works, North Shields,
Nov. 13, 1900.

BRISTOL GAS COMPANY.

OIL OR SPIRIT FOR GAS ENRICHMENT.

THE Directors are prepared to consider OFFERS for the supply of the above for delivery during the period ending the 31st of December, 1901.

Particulars may be obtained from the undersigned, to whom also Tenders, must be delivered not later than Wednesday, the 5th of December next.

JOHN PHILLIPS,
Secretary.

Chief Office: Canons' Marsh,
Bristol, Nov. 8, 1900.

BRISTOL GAS COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations during a period of One, Two, or Three Years, commencing on the 1st day of January, 1901.

The annual quantities of Tar produced at each of the Stations at present are, approximately, as follows:—

Avon Street	. . .	700,000 gallons
Canons' Marsh	. . .	550,000 „
Stapleton	. . .	850,000 „

Further Particulars, with Forms of Tender, may be obtained on application to the undersigned, to whom also Tenders, sealed and endorsed "Tender for Tar," must be delivered not later than Wednesday, the 5th day of December next.

JOHN PHILLIPS,
Secretary.

Chief Offices, Canons' Marsh,
Bristol, Nov. 8, 1900.

SHEFFIELD UNITED GASLIGHT COMPANY.

TO ENGINEERS AND IRONFOUNDERS.

THE Directors of the above Company invite TENDERS for the supply at their Neepsend Station of about 640 lineal feet of 30-inch, 24-inch, 18-inch, and 12-inch diameter STEEL PIPES, to form Foul Gas-Mains; also SUNDRY SPECIAL PIPES and CAST-IRON BRACKETS, &c.

Drawings may be seen, and Specification with Form of Tender obtained on and after Nov. 26, 1900, from the Engineer, Mr. J. W. Morrison, at the Company's Offices.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders marked "Tender for Foul Mains," must be delivered (by post) not later than the first post on Wednesday, Dec. 5, to the undersigned.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
Nov. 14, 1900.

EAST SURREY WATER COMPANY.

SALE BY TENDER
OF NOT EXCEEDING
1500 ORDINARY "B" SHARES OF £10 EACH.

COPIES of Particulars and Conditions, with Form of Tender, can be obtained at the Company's Office, Redhill, Surrey.

Tenders to be delivered not later than Noon on Tuesday, the 11th of December.

By order of the Directors.

REDHILL GAS COMPANY.

MR. HARRIE STACEY is favoured with Instructions to SELL BY AUCTION at the Market Hall, Redhill, on Thursday, the 29th of November, 1900, at Seven o'clock p.m. precisely,

£7500

FIVE PER CENT. ORDINARY "B" STOCK, subject to the Sliding-Scale, in Lots of £50 and £100 each.

Particulars and Conditions of Sale to be obtained at the OFFICES of the COMPANY, Brighton Road, REDHILL; of Messrs. RADCLIFFE, CATOR, & HOOD, Solicitors, 20, Craven Street, CHARING CROSS, W.C.; and of Mr. HARRIE STACEY, Auctioneer and Land Agent, REDHILL and REIGATE.

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MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND GAS COMPANY.

NEW ISSUE OF £5000 NEW ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 4, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

GRAYS GAS COMPANY, LIMITED.

NEW ISSUE OF 250 £10 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 4, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of Trustees and Others.

HARROW AND STANMORE GAS COMPANY.

40 ORIGINAL "A" SHARES.
10 £10 GUARANTEED SIX PER CENT. SHARES.

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Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

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NEW ISSUE OF £4000 NEW ORDINARY STOCK, AND £2300 THREE PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Dec. 10, at Two o'clock, in Lots.

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By order of the Directors of the

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£7500 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Dec. 10, at Two o'clock, in Lots.

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Sulphur	0·58 „
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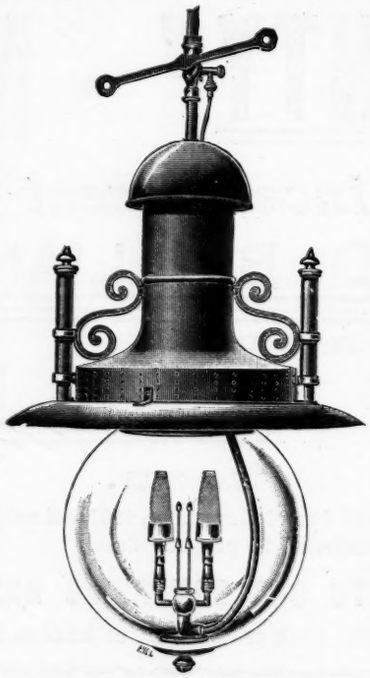

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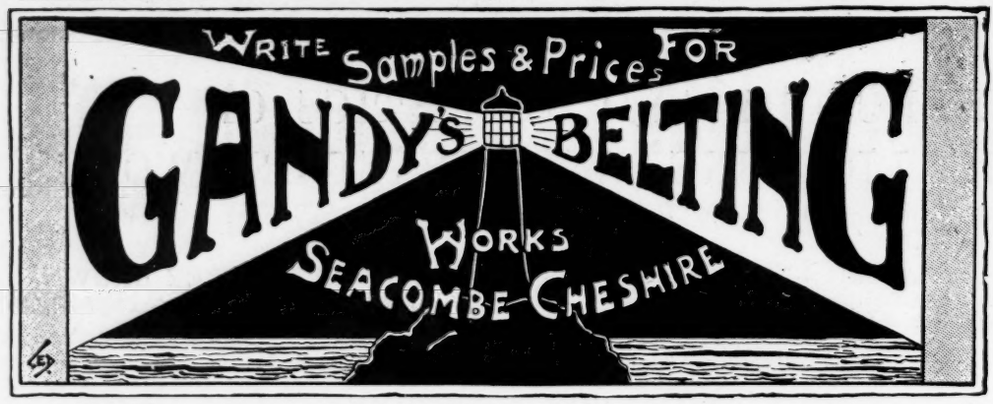

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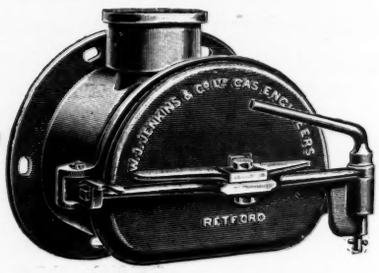

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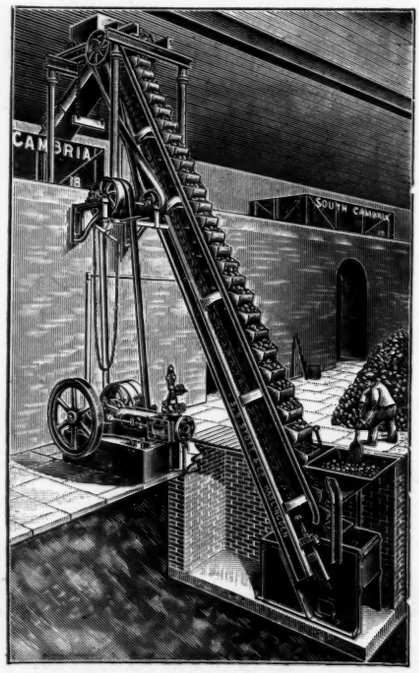

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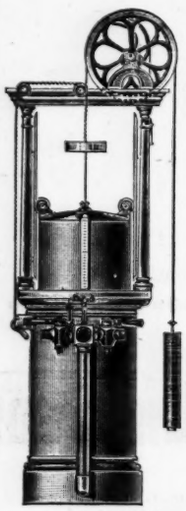

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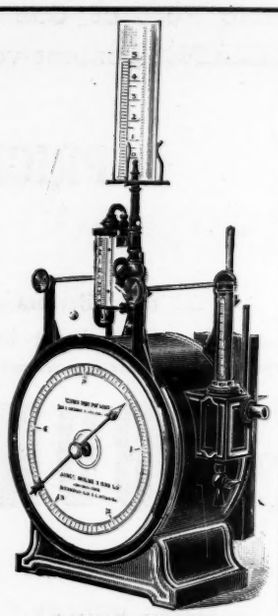

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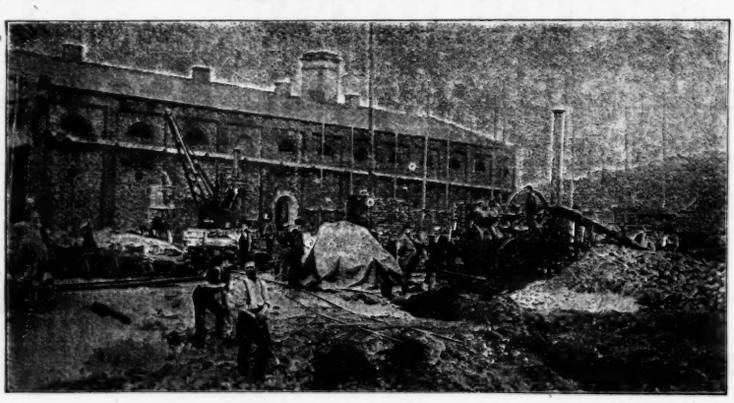

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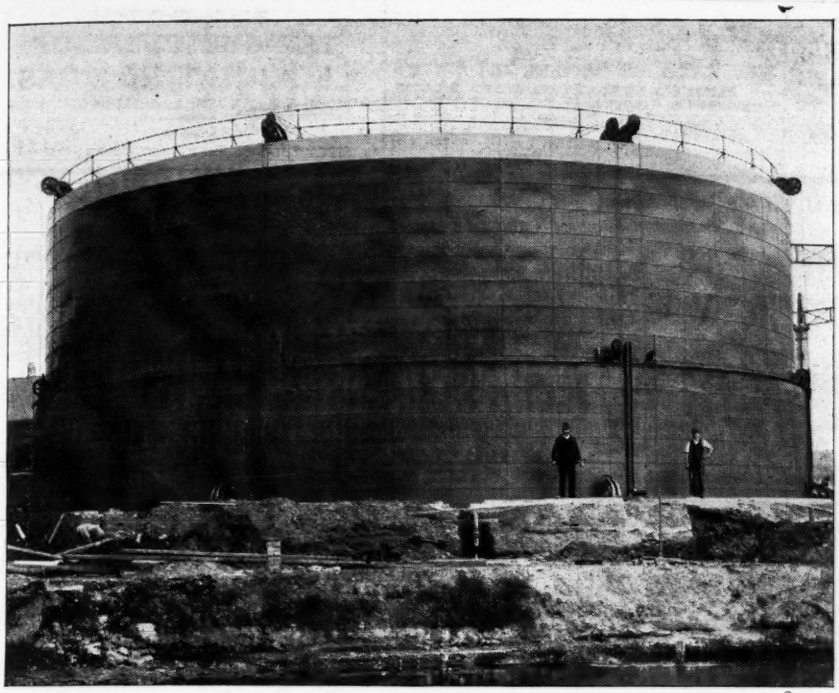

Two-Lift Cable-Guided Gasholder, 80 ft. diameter by 20 ft. deep.
STAFFORD CORPORATION GAS-WORKS. (*From a Photo.*)

COPY OF TESTIMONIAL.

CORPORATION OF STAFFORD,
GAS & ELECTRICITY DEPARTMENT,
STAFFORD, *Feb.* 9, 1899.

Messrs.
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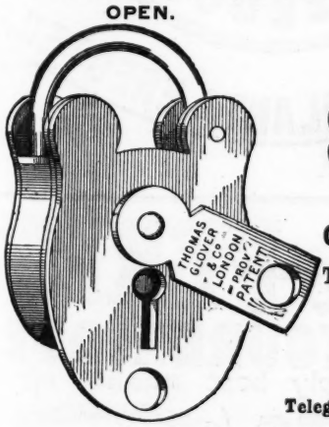

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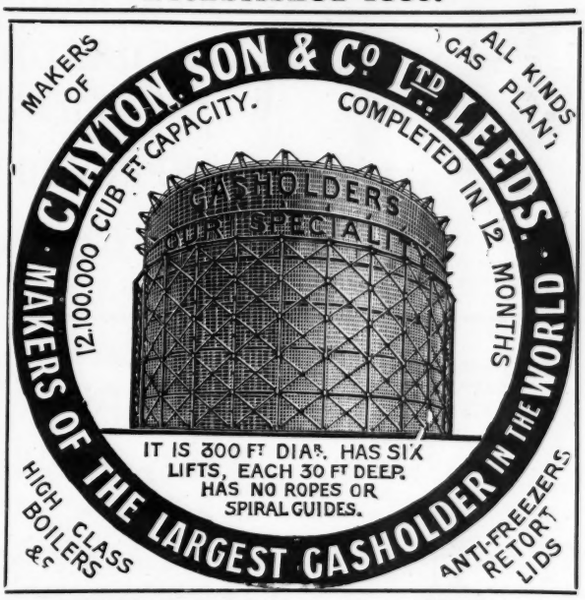
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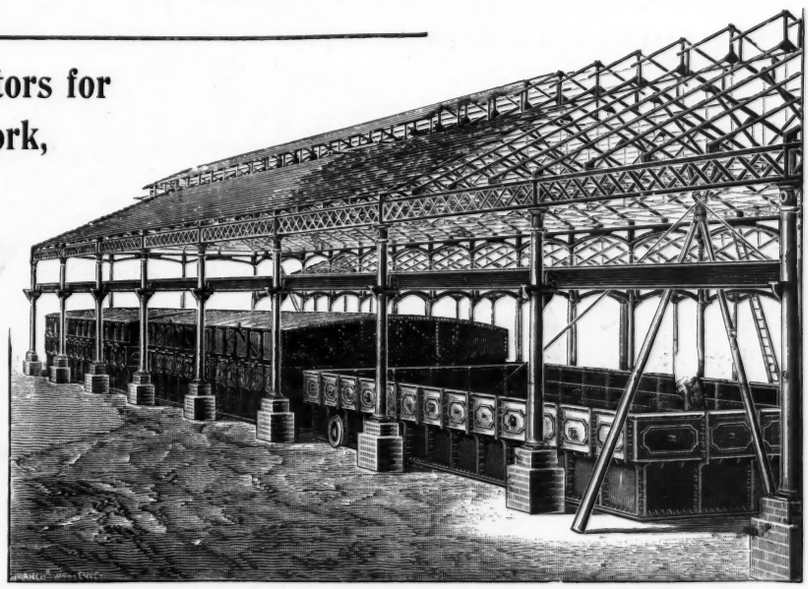

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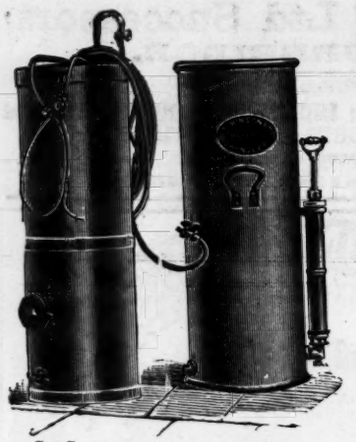

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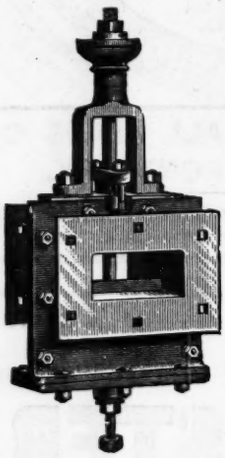

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